Masterclock Product Catalog
2012-2013

Masterclock®

CE FC

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Master Clock Overview 1.0

Multi-functional and Dedicated Master Clocks

What is a Multi-functional Master Clock?

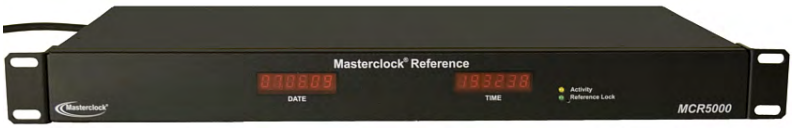
A Multi-functional Master Clock is capable of generating/receiving and outputting multiple time signals for system wide (and cross system) time synchronization. Here is a quick list of possibilities:

Inputs

- GPS
- NTP
- Time Code
  - IRIG-A
  - IRIG-B
  - IRIG-E
  - SMPTE
  - EBU
- NMEA
- Internal Oscillator

Outputs

- NTP
- Time Code
  - IRIG-A
  - IRIG-B
  - IRIG-E
  - SMPTE
  - EBU
- NMEA
- 10MHz Sine wave
- Programmable Pulse



MCR5000
1U rack mountable, maximum I/O options
Section 1.2

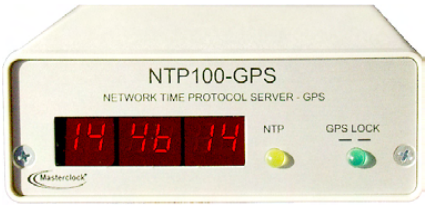
MCR1000
Compact
Section 1.1

The Multi-functional Master Clocks are modular and customizable. An example system could receive its primary time signal from GPS satellites and output that signal to both your network via NTP and audio/video equipment via time code. If the GPS receiver loses signal, our master clock has an internal oscillator that it will automatically switch to during a loss and then back from when the GPS signal returns. All of this is contained in one device.

What is a Dedicated Master Clock?

A Dedicated Master Clock generally inputs only one time signal and outputs only one time signal. For example, the NTP100-GPS receives its time signal from GPS satellites and outputs NTP time. The TCO100 has an internal oscillator that generates the time and outputs time code. And the NTP100-TC receives time code and outputs NTP.

TCO100
Internal oscillator to time code
Section 2.7



NTP100-GPS
GPS to NTP
Section 2.1

NTP100-TC
Time code to NTP
Section 2.5

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Multi-functional Master Clocks 1.1

MCR1000

Reference Options

- **GPS**
- **NTP**
- **Time Code**
- **High Stability Oscillator**
- **NMEA 0183**
- **NENA 911 PSAP Standard**

Output Options

- **NTP**
- **Time Code**
- **Truetime/Kinemetrics**
- **NMEA 0183**
- **NENA 911 PSAP Standard**
- **PPO**
- **PPS**
- **10MHz sine wave**

The MCR1000 **M**aster **C**lock **R**eference system is a compact, precision time and frequency device.
One unit can reference and output NTP, time code, and 10 MHz sine wave all locked to the Atomic Clocks in the GPS satellites with a high stability crystal oscillator backup in the case that GPS signal is lost. With specifications that are equal or better than almost any other similar product the MCR is up to 60% less expensive than its competition.
The MCR1000 is available in multiple configurations to fit almost any need with configurable modules.

Rack mountable with an **RM4**

MODULAR FEATURES

Reference Sources

- Atomic Clocks in GPS Satellites via GPS Antenna
- NTP via Ethernet
- Time Code - IRIG A, B, and E, SMPTE, EBU
- High stability OCXO oscillator ± .25 min/year
- NMEA 0183 via RS-232 or USB
- NENA Format 0, 1, and 8 via RS-232 or USB

Outputs

- PC time set via USB serial
- NTP - client via 10/100 Mb Ethernet
- Time Code - IRIG A, B, and E, SMPTE, EBU
- NMEA 0183 via RS-232 or USB
- NENA Format 0,1, and 8 via RS-232 or USB
- 5V at 20mA Pulse Per Second and Programmable Pulse Output
- 10MHz sine wave
- DB9 - Breakout adapter

Other Features

- Programmable relay closure. 1 event per day with N/O (N/C configurable) dry relay contact, 24V - AC/DC (250mA max)
- 6 or 9 digit display
- Basic Relay Scheduler for multiple events per day

Setup & Configuration Software

- WinDiscovery app
- Telnet software for UNIX/LINUX

Physical

Size:	6.75 x 4.13 x 1.5 in 17.15 x 10.48 x 3.81 cm	**Weight:**	17.3 oz 490.5 g

Operating Temperature and Humidity

- Temperature: 0 to +60°C (0 to 40°C ±1 min/year)
- Humidity: Up to 90%, non-condensing

In depth module datasheets on the following pages.

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MCR5000

Reference Options

- GPS
- NTP
- Time Code
- High Stability Oscillator
- NMEA 0183
- NENA 911 PSAP Standard

Output Options

- NTP
- Time Code
- Truetime/Kinemetrics
- NMEA 0183
- NENA 911 PSAP Standard
- PPO (Programmable Pulse Output)
- PPS (Pulse Per Second)
- 10MHz sine wave

The MCR5000 Master Clock Reference system is a 1U rack mount, precision time and frequency device. Able to install more modules than the MCR1000.

One compact unit can reference and output NTP, time code, and provides a 10 MHz sine wave all locked to the Atomic Clocks in the GPS satellites with a high stability crystal oscillator backup in the case that GPS signal is lost.

With specifications that are equal or better than almost any other similar product the MCR is up to 60% less expensive than its competition.

The MCR5000 is available in multiple configurations to fit almost any need with configurable plug-in modules.

MODULAR FEATURES

Reference Sources

- Atomic Clocks in GPS Satellites via GPS Antenna
- NTP via Ethernet
- Time Code - IRIG A, B, and E, SMPTE, EBU
- High stability OCXO oscillator ± .25 sec/year
- NMEA 0183 via RS-232 or USB
- NENA Format 0, 1, and 8 via RS-232 or USB

Outputs

- PC time set via USB
- NTP - client via 10/100 Mb Ethernet
- Time Code – IRIG A, B, and E, SMPTE, EBU
- NMEA 0183 via RS-232 or USB
- NENA Format 0, 1, and 8 via RS-232 or USB
- 5V at 20mA Pulse Per Second and Programmable Pulse Output
- 10 MHz sine wave
- DB9 – breakout adapter

In depth module datasheets on the following pages.

Other Features

- Programmable relay closure. 1 event per day with NO / NC dry contact relay, 24V - AC/DC (250mA max)
- Up to two 6-digit displays: time and date
- Optional relay scheduler for multiple events

Operating Temperature and Humidity

- Temperature: 0 to +60°C (0 to 40°C ±1 min/year)
- Humidity: Up to 90% (non-condensing at 25°C)

Physical

Size:	19 x 9 x 1.75 in 48.3 x 22.9 x 4.5 cm	**Weight:**	3 lbs 1.36kg

Power

- AC input, IEC power cord (100-240 VAC, 50/60 Hz)
- Power consumption 10W

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MCR Modules and Add-ins

FEATURES	Basic MCR Units
Manual time set via network & USB	√
NENA In/Out (Format 0, 1, and 8)	√
NMEA 0183 In (ZDA, GGA, GLL, RMC)	√
NMEA 0183 Out (ZDA)	√
NTP Input client software	√
PPS	√
Relay programmable - 1 event	√
RS232 Port	√
TCXO oscillator ± 1 min/year	√
TELNET network setup software	√
Time/Date data output via USB	√
USB Port	√
Windows USB setup software	√
Windows network setup software	√

Basic MCR1000

FEATURES	Modules and Add-ins							
(M) - Module, (F) - Firmware, (S) - Software	GPS (M)	TCR (M)	TCG (M)	NTP (F)	HSO (M)	PPO (M)	LED Display (M)	Event Time (S)
Catalog Page Number	1.3.1	1.3.2	1.3.3		1.3.5	1.3.6	1.3.7	1.3.7
10 MHz Output Sine Wave					√A			
Atomic Clock Accuracy	√							
Day of Year and Time/Date Display							√*	
IRIG-A & E Generator			√A					
IRIG-A & E Reader		√A						
IRIG-B & SMPTE/EBU Time Code Generator			√					
IRIG-B & SMPTE/EBU Time Code Reader		√						
Additional NMEA 0183 Out (ZDA, GGA, GLL, GSA, GSV, RMC, VTG)	√							
NTP Time Server Function				√				
OCXO Oscillator ± .25 Seconds/Year					√			
PPO - Programmable Pulse Output						√		
Relay Programmable – Multiple Event								√
Time Code Format Translation		√	√					
Time/Date Display							√*	

LEGEND

√ Module/Add-in provides selected feature.

√A Advanced version of option provides selected feature.

√* Different options are available for MCR1000 and MCR5000.

Basic MCR5000

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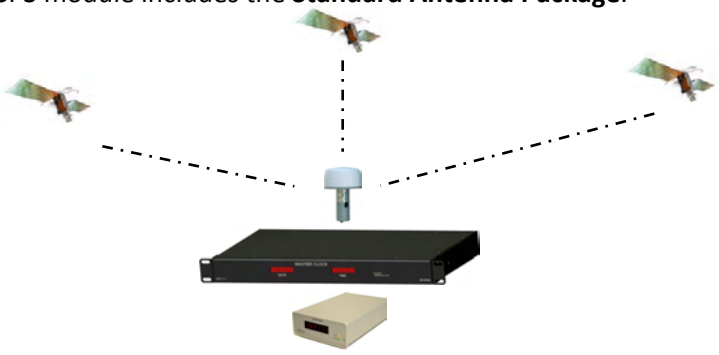
MCR-GPS Module

Key Features

- Receives time simultaneously from up to 12 satellites utilizing the GPS satellite system
- Provides accurate reference to within ± 100 nS of UTC
- NMEA-0183 messages on serial port output with option installed
- Provide most accurate external time source for MCR
- Includes either Standard Antenna or Basic Antenna Package
- Antenna cable lengths up to 500'/152 m available
- In-line surge arrestors and in-line GPS amplifiers available
- Compact design for portable applications
- May be added to **MCR1000** or **MCR5000**

Masterclock's MCR-GPS (GPS Receiver) is an add-in module option for Master Clock Reference Devices. It provides a precision time reference based upon the Global Positioning Satellite System.
The GPS option maintains and provides an excellent atomic time reference based on reception of time from up to 12 GPS satellites simultaneously.
NMEA-0183 satellite and date/time information messages available on serial port with option installed. PPS on-time output locked to top of second.
Each MCR may be ordered with an MCR-GPS module option (MCR1000, MCR5000, and MCRPCIe).
The GPS module includes the **Standard Antenna Package**.



MCR-GPS Module

Specifications	Receiver
Satellites	12 Channel, up to 12 satellites simultaneously, parallel
Frequency	L1, 1575 MHz
Antenna Connector	SMA Female
RF Bias to Antenna	3V DC, Center Pin
PPS	4 µs, TTL level, on-time leading edge
Accuracy	± 100 nS of UTC
	Antenna
Type	Active, External
Gain	32 dB
Mount	Outdoor, threaded pipe/mast. M24 x 1.5 internal thread. Mounting kit provided.
Operating Temperature	-40° to 85°C, (high humidity)
Voltage	3/5 VDC, center pin
Power Consumption	.24 W @ 22 mA
Polarization	Right Hand Circular
Weight	4.9 oz (*140 g*)
Impedance	50
Dimension	3.7" diameter x 4.9" length (*96mm x 126mm*)
Connector	SMA Female
Antenna Cable	50' (*15m*) Beldin 8219, 50 Ohm low loss with SMA male connectors

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MCR-TCR Module

Key Features

- Reads and synchronizes to SMPTE & IRIG time codes
- Software controlled
- Optional Advanced Time Reader (see below)
- Autodetection and automatic gain control of incoming time code
- May be added to **MCR1000** or **MCR5000**

Additional Option MCR-TCRA

Advanced Time Code Reader Firmware Option

Decode IRIG-A and IRIG-E waveforms

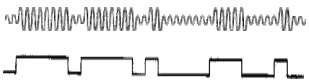
Masterclock's MCR-TCR (Time Code Reader) is an add-in module option for Master Clock Reference devices which reads and synchronizes to SMPTE or IRIG-B time code.

Affordable price and flexible order options make this a popular add-in for synchronizing to time code in broadcast, industry, power distribution and monitoring as well as for specialized military applications.

The TCR option automatically detects and locks to the incoming time code using an automatic gain control circuit. It is software controlled and locks to the most accurate time reference.

Advanced time code reader is an optional feature that enables the decoding of IRIG-A and IRIG-E waveforms.

Each MCR may be ordered with an MCR-TCR module option.



Optional Interconnects:
BNC9 female adapter, Terminal Block adapter (MCR1000)
BNC female, 3 POS Terminal Block (MCR5000)

Specifications		Time Codes Read			Additional Time Codes with Advanced TCR Option			
Format		SMPTE 12M	IRIG-B DCLS	IRIG-B AM	IRIG-A DCLS	IRIG-A AM	IRIG-E AM	IRIG-E DCLS
Rate		24,25, 30 fps NDF	1kHz, 1mS	1kHz, 1mS	10kHz, 0.1mS	10kHz, 0.1mS	100Hz, 10mS	100Hz, 10ms
Input Level Range		0.2 – 18Vpp 2 Vpp $_{nom}$	0.5 - 12 Vp 5Vp $_{nom}$	0.5 – 8 Vpp 5 Vpp $_{nom}$	0.5 - 12 Vp 5Vp $_{nom}$	0.5 – 8 Vpp 5 Vpp $_{nom}$	0.5 - 12 Vp 5Vp $_{nom}$	0.5 – 8 Vpp 5 Vpp $_{nom}$
Input Impedance kΩ		>10 kΩ			>10 kΩ		>10 kΩ	
Mark to Space Ratio		NA	NA	3.3:1	NA	3.3:1	NA	3.3:1
Automatic Gain Adjust		Over input level range			Over input level range		Over input level range	
Number of Inputs SE: Single Ended - Unbalanced Differential- Balanced		1SE 1DIFF	1SE 1DIFF	1SE 1DIFF	1SE 1DIFF	1SE 1DIFF	1SE 1DIFF	1SE 1DIFF
Type		NDF	DCLS	AM 1kHz	DCLS	AM 10kHz	DCLS	AM 100Hz
ENCODING		None, Leitch Date, SMPTE 309M	None, IEEE 1344 year, IRIG STD 200-04		None, IEEE 1344 year, IRIG STD 200-04		None, IEEE 1344 year, IRIG STD 200-04	
IRIG Coded Expression IRIG STD 200-04	0 BCD_{TOY}, CF,SBS	NA	B000	B120	A000	A130	E000	E110
	1 BCD_{TOY}, CF	NA	B001	B121	A001	A131	E001	E111
	2 BCD_{TOY}	NA	B002	B122	A002	A132	E002	E112
	3 BCD_{TOY},SBS	NA	B003	B123	A003	A133	E003	E113
	4 BCD_{TOY}, BCD_{Year}, CF,SBS (IEEE-1344 – 1995 encoding)	NA	B004	B124	A004	A134	E004	E114
	5 BCD_{TOY}, BCD_{Year}, CF	NA	B005	B125	A005	A135	E005	E115
	6 BCD_{TOY}, BCD_{Year},	NA	B006	B126	A006	A136	E006	E116
	7 BCD_{TOY}, BCD_{Year}, SBS	NA	B007	B127	A007	A137	E007	E117

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MCR-TCG Module

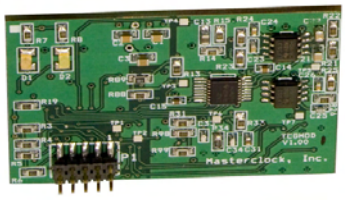
Key Features

- Generates SMPTE & IRIG time codes
- Software controlled
- Optional Advanced Time Code Generation (see below)
- Locks to most accurate time source (GPS Receiver, Time Code Reader, NTP Client, HSO)
- May be added to **MCR1000** or **MCR5000**

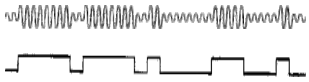
Additional Option MCR-TCGA

Advanced Time Code Generation Firmware

Provides IRIG-A and IRIG-E waveforms



Masterclock's MCR-TCG (Time Code Generator) is an add-in module option for Master Clock Reference devices which provides generation of SMPTE or IRIG-B time code.
Affordable price and flexible order options make this a popular add-in for providing time code in broadcast, industry, power distribution and monitoring as well as for specialized military applications.
The TCG option is software controlled and locks to the most accurate time reference.
Advanced time code generation is an optional feature to provide IRIG-A and IRIG-E waveform generation.
Each MCR may be ordered with an MCR-TCG module option.



Optional Interconnects:
BNC9 female adapter, Terminal Block adapter (MCR1000)
BNC female, 3 POS Terminal Block (MCR5000)

Specifications		Time Codes Generated			Additional Time Codes with Advanced TCG Option			
Format		SMPTE 12M	IRIG-B DCLS	IRIG-B AM	IRIG-A DCLS	IRIG-A AM	IRIG-E DCLS	IRIG-E AM
Rate		24,25, 30 fps NDF	1kHz, 1mS	1kHz, 1mS	10kHz, 0.1mS	10kHz, 0.1mS	100Hz, 10mS	100Hz, 10mS
Output Level @ 600Ω		4Vpp (5.2 dBm)	3 Vp (2.7 dBm)	4Vpp (5.2 dBm)	3 Vp (2.7 dBm)	4Vpp (5.2 dBm)	3 Vp (2.7 dBm)	4Vpp (5.2 dBm)
Output Level @ 50 Ω		3Vpp (13.5dBm)	1.75Vp (8.8dBm)	3Vpp (13.5dBm)	1.75Vp (8.8dBm)	3Vpp (13.5dBm)	1.75Vp (8.8dBm)	3Vpp (13.5dBm)
Mark to Space Ratio		NA	NA	3.3:1	NA	3.3:1	NA	3.3:1
Gain		1	1	1	1	1	1	1
Number of Outputs SE: Single Ended - Unbalanced Differential- Balanced (*excludes model MCR1000)		1SE *1DIFF	1SE *1DIFF	1SE *1DIFF	1SE *1DIFF	1SE *1DIFF	1SE *1DIFF	1SE *1DIFF
Type		NDF	DCLS	AM 1kHz	DCLS	AM 10kHz	DCLS	AM 100Hz
ENCODING		None, Leitch Date, SMPTE 309M	None or IEEE 1344 year or IRIG STD 200-04		None or IEEE 1344 year or IRIG STD 200-04		None or IEEE 1344 year or IRIG STD 200-04	
IRIG Coded Expression IRIG STD 200-04	0 BCD_{TOY}, CF,SBS	NA	B000	B120	A000	A130	E000	E110
	1 BCD_{TOY}, CF	NA	B001	B121	A001	A131	E001	E111
	2 BCD_{TOY}	NA	B002	B122	A002	A132	E002	E112
	3 BCD_{TOY},SBS	NA	B003	B123	A003	A133	E003	E113
	4 BCD_{TOY}, BCD_{Year}, CF,SBS (IEEE-1344 –1995 Encoding)	NA	B004	B124	A004	A134	E004	E114
	5 BCD_{TOY}, BCD_{Year}, CF	NA	B005	B125	A005	A135	E005	E115
	6 BCD_{TOY}, BCD_{Year},	NA	B006	B126	A006	A136	E006	E116
	7 BCD_{TOY}, BCD_{Year}, SBS	NA	B007	B127	A007	A137	E007	E117

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Key Features

- Reads, synchronizes to, and outputs NMEA-0183 ASCII Messages
- NMEA code transmitted over Ethernet, RS-232 and USB ports
- Software controlled
- Supports multiple baud rates from4,800 to 57,600
- May be added to MCR1000 and MCR5000

Masterclock's MCR-NMEA is an add-in firmware option for Master Clock Reference devices which reads and synchronizes or outputs NMEA-0183 messages.

The NMEA input option automatically detects and locks to the incoming NMEA-0183 messages. It is software controlled and locks to the most accurate time reference message available.

Specifications	Input/Output NMEA time stamped messages
Messages Supported	**ZDA, GGA*, GLL*, GSA*, GSV*, RMC*, VTG***
Baud Rates Supported	**4800**, 9600, 19200, 38400, 57600
Data Bits	**8**, 7
Parity	**None**, Odd, Even
Stop bits	**1**, 2
Decode Rate	Up to once per second per message
Accuracy	Within 10 ms of receipt of first character of NMEA packet Overall accuracy to UTC top of second is dependent upon the NMEA output

*Requires MCR-GPS Module to output

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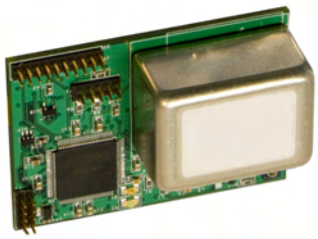
MCR-HSO Module

Key Features

- Available in three precision grade levels
- Typical holdover stability of 1 ppb/day, or better with OCXO
- Optional 10MHz Sine Wave Frequency Reference Output
- Locks to most accurate time source (GPS Receiver, Time Code Reader, NTP Client)
- May be added to **MCR1000** or **MCR5000**

Additional Option MCR-10Mhz
10MHz Sine Wave Reference Output Option



***MCR-HSO* Module**

Masterclock's MCR-HSO (High Stability Oscillator) is an add-in module option for Master Clock Reference devices which provides precision time and frequency for a wide range of applications. Affordable price and flexible order options make this a popular add-in for meeting critical time keeping during holdover (loss of primary reference such as GPS) as well as for specialized applications requiring a precise frequency reference.
The HSO option maintains excellent holdover stability of 1ppb/day or better using an OCXO. Various grade level options are available for specific applications.
An optional precision frequency 10MHz sine wave reference output is available as a source for laboratory use, or an RF reference such as cellular applications. When locked to GPS, the 10 MHz sine wave frequency will have the same long-term stability as an atomic clock. Each MCR may be ordered with an MCR-HSO module option. The MCR-HSO option is required for all 10 MHz sine wave references.

Optional Interconnects:
10MHz Ref -
SMA female (MCR1000)
BNC female (MCR500)

Specifications		High Stability Oscillator (HSO) Grade Option		
Freq = 10.000000 MHz Ref Waveform = Sine wave		**1**	**3**	**4**
Oscillator Type		VCTXO	OCVCXO	OCVCXO
Level (dBm) @ 50Ohms		7dBm ±2dBm	7dBm ±1dBm	8dBm ±1dBm
Freq Stability - Aging /day		TBD	±1.0 ppb/day (1x10E-9)	±0.1 ppb/day (1x10E-10)
Freq Stability - Aging/year		±1 ppm/year ($1x10E^{-6}$)	±0.3 ppm/year ($3x10E^{-7}$)	±0.1 ppm/year ($1x10E^{-7}$),
Short Term Stability (Allan Variance) 1 sec gate		TBD	≤ 1.0 e^{-10}	≤ 5.0 e^{-11}
Time Drift per Year (max)		±3 sec	±.0.3 sec	±0.15 sec
Temp Stability		±2.5ppm (-30 to 75°C)	±0.010 ppm (-5 to 50°C)	±0.050 ppm (0 to 50°C)
Gain		1	1	1
Number of Outputs – (10 MHz Sine wave Option)		1 (clipped sine wave)	1	1
Harmonic		NA	-30dBc Max	-30dBc Max
Phase Noise (dBc/Hz) @ 10MHz	**1Hz**	NA	NA	-95
	10Hz	NA	-120	-125
	100Hz	NA	-130	-140
	1kHz	NA	-140	-150
	10kHz	NA	-145	-150
	100kHz	NA	-145	-150

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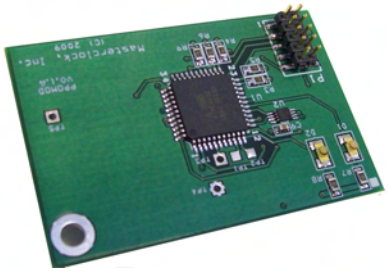
Key Features

- User programmable pulse width
- .0001 to 214,747 seconds (approximately 2.4 days), with 100 µs resolution
- Edge triggered at top of second and synchronized to PPS
- One-shot, pulse train, or frequency generator modes with number of cycles up to 4 million
- Active high or active low pulse
- May be added to MCR1000 and MCR5000

Masterclock's MCR-PPO (Programmable Pulse Output) is an add-in module option for Master Clock Reference devices which provides a precision time referenced pulse output synchronized to the PPS of your MCR System.
The PPO option provides a pulse reference based on the high precision PPS of your Master Clock Reference.
Pulse widths from 100 µs to over 2 days, with resolution of 50 µs, are achievable. You may set your pulse to be active high or active low, triggered from the top of second. Pulses may be one shot, or you may use to produce pulse trains or as a frequency generator.
Each MCR may be ordered with an MCR-PPO module option.



***MCR-PPO* Module**

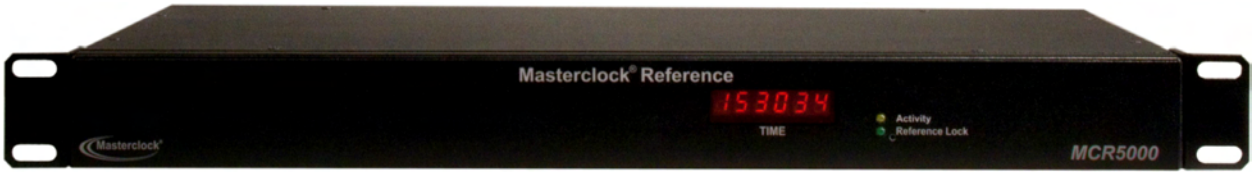
Specifications	Programmable Pulse Output Option
Modes	Frequency generator, one-shot pulse generator, pulse train (programmable cycles)
Frequency Range	4.657 e-6 Hz to 200 kHz
Pulse Width Range	.0001 seconds to 214,747 seconds
Resolution	100 µs
Programmable cycles	1 to 4,000,000 (0 cycles = continuous free running)
Accuracy	± 50 µs of PPS edge
Pulse Type	Active High or Active Low (5V at 20mA)
Trigger	MCR System PPS

Display Modules

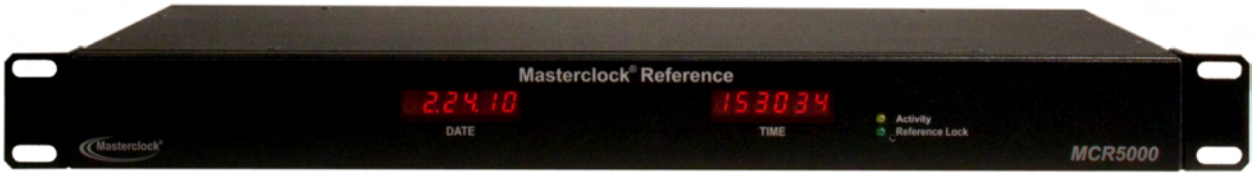
6 Digit Display Module - MCR1000

9 Digit Display Module - MCR1000

6 Digit Display Module - MCR5000

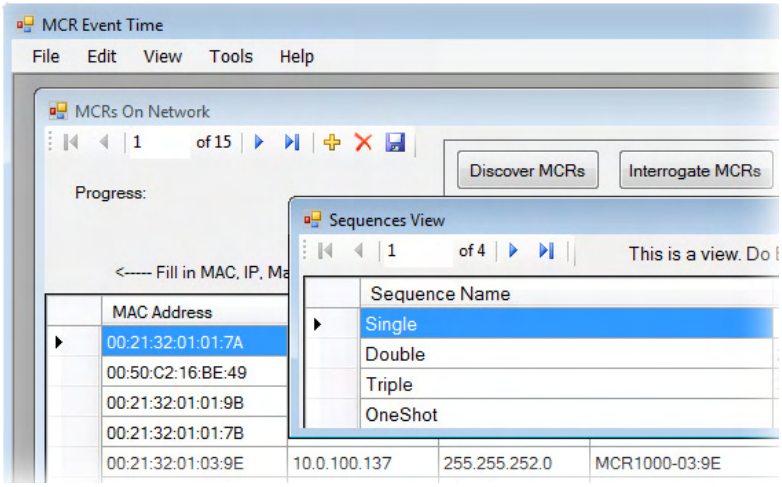


2-6 Digit Display Modules - MCR5000



Event Time Software

MCR Event Time allows one to easily make a schedule for activating a relay[1] built into both of the MCR units. Up to 128 events can be scheduled per day. An MCR without this software is limited to one scheduled relay.



[1]N/O contacts, 24V AC/DC, 250 mA max rating

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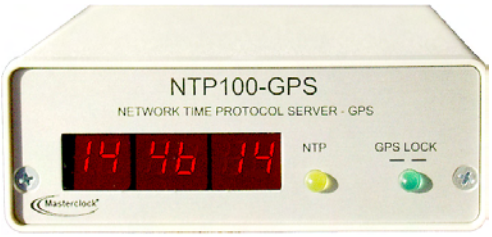
NTP100-GPS



CE

FEATURES

- NTP Reference for Ethernet LANs in self-contained box
- Time synchronized to atomic clock in GPS satellites providing Stratum 1 accuracy
- NTP query(unicast), multicast, or broadcast modes
- Assignable network configuration
- Telnet or serial interface – Discovery Tools included.
- Uses state-of-the-art 8 channel Trimble receiver module
- Includes pre-amplified antenna, antenna cable, and mounting kit
- 115/220 VAC or 9-28 VDC operation

Rack mountable with an **RM4**

SPECIFICATIONS

Outputs

- NTP reference for query(unicast), multicast, or broadcast mode – user definable

Rack Mount

- Optional rack mount kit is available - RM4

Connectors

- RJ45, 10/100 MB / sec Ethernet connection
- Antenna - SMA
- DC input - 2 mm jack

Physical

Size:	6.75 x 4.13 x 1.5 in 17.15 x 10.48 x 3.81 cm	**Weight:**	17.3 oz 490.5 g

Case

- Cover - off white aluminum
- Front/rear panel - clear anodized aluminum

Antenna

- A weather-proof, pre-amplified antenna is included with 16' (*5m*) of coaxial cable. An optional antenna kit is available with antenna, 50'/15m cable and antenna mounting bracket.

Time Reference

- When synchronized to atomic clocks in GPS satellites the long term accuracy of the NTP100 is the same as the atomic clock of the GPS
- After initial synchronization and (if) upon loss of GPS signal the NTP100 will revert to an internal temperature compensated crystal oscillator and typically maintain accuracy of <165 ms per day.

Power Supply

- 9-28VDC input. Includes an external 12 VDC wall mount power supply with locking DC plug, UL & CE listed
- 115/220, 50/60 Hz, < 10 W Power AC Input
- Supplied with your choice of US, Euro, British or AUS/NZ plug - others optionally available

Compliance

- CE Marked – Available for sale in EU
- FCC, Part 15, Class B, emissions

Operating Temperature and Humidity

- Temperature: 0 to +50°C
- Humidity: Up to 90% (non-condensing at 25°C)

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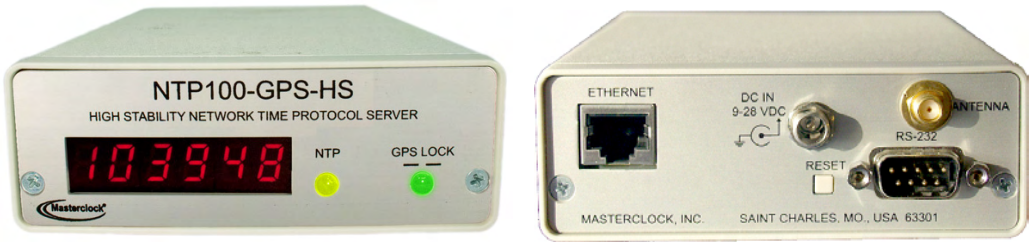
NTP100-GPS-HS



CE

FEATURES

- NTP Reference for Ethernet LANs in self-contained box
- Time synchronized to atomic clock in GPS satellites providing Stratum 1 accuracy
- Typical holdover stability of 1ppb/day (<7 sec/year) using high precision internal OCXO during GPS loss.
- NTP query(unicast), multicast, or broadcast modes
- Assignable network configuration
- Telnet or serial interface – Discovery Tools included.
- Uses state-of-the-art 8 channel Trimble receiver module
- Includes pre-amplified antenna, antenna cable, and mounting kit
- 115/220 VAC or 9-28 VDC operation

Rack mountable with an **RM4**

SPECIFICATIONS

Outputs

- NTP reference for query(unicast), multicast, or broadcast mode – user definable

Rack Mount

- Optional rack mount kit is available - RM4

Connectors

- RJ45, 10/100 MB / sec Ethernet connection
- Antenna - SMA
- DC input - 2 mm jack

Physical

Size:	6.75 x 4.13 x 1.5 in 17.15 x 10.48 x 3.81 cm	**Weight:**	17.3 oz 490.5 g

Case

- Cover - off-white aluminum
- Front/rear panel - clear anodized aluminum

Antenna

- A weather-proof, pre-amplified antenna is included with 16'/5m of coaxial cable. An optional antenna kit is available with antenna, 50'/15m cable and antenna mounting bracket

Time Reference

- When synchronized to atomic clocks in GPS satellites the long term accuracy of the NTP100 is the same as the atomic clock of the GPS
- After initial synchronization and (if) upon loss of GPS signal the NTP100 will revert to an internal temperature compensated crystal oscillator and typically maintain accuracy of <165 ms per day.

Power Supply

- 9-28VDC input. Includes an external 12 VDC wall mount power supply with locking DC plug, UL & CE listed
- 115/220, 50/60 Hz, < 10 W Power AC Input
- Supplied with your choice of US, Euro, British or AUS/NZ plug - others optionally available

Compliance

- CE Marked – Available for sale in EU
- FCC, Part 15, Class B, emissions

Operating Temperature and Humidity

- Temperature: 0 to +60°C (0 to 40°C ±1 min/year)
- Humidity: Up to 90% (non-condensing at 25°C)

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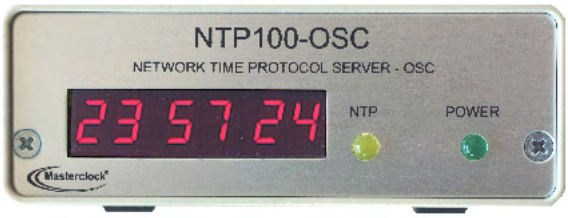
NTP100-OSC



FEATURES

- NTP Reference for Ethernet LANs in selfcontained box
- Time synchronized to internal precision temperature compensated crystal oscillator (TXCO)
- NTP query (unicast), multicast, or broadcast modes
- Assignable network configuration
- Telnet or serial interface – Discovery Tools included
- After initial input of time setting the NTP100-OSC will typically maintain accuracy of ± 1min/year or < 165ms per day using an internal TCXO and battery backed real-time clock circuit.

Rack mountable with an **RM4**

SPECIFICATIONS

Outputs

- NTP reference for query(unicast), multicast, or broadcast mode – user definable

Rack Mount

- Optional rack mount kit is available - RM4

Connectors

- RJ45, 10/100 MB / sec Ethernet connection
- DC input - 2 mm jack

Physical

Size:	6.75 x 4.13 x 1.5 in 17.15 x 10.48 x 3.81 cm	**Weight:**	17.3 oz 490.5 g

Case

- Cover - off-white aluminum
- Front/rear panel - clear anodized aluminum

Compliance

- CE Marked – Available for sale in EU
- FCC, Part 15, Class B, emissions

Operating Temperature and Humidity

- Temperature: 0 to +60°C (0 to 40°C ±1 min/year)
- Humidity: Up to 90% (non-condensing at 25°C)

Setup and Control Software

- Supports DHCP/BOOTP for automatic acquisition of network address, nameservers, and time server configuration.
- Provides dynamic configuration for networking parameters.
- Configure clocks through provided network WinDiscovery tool or TELNET
- Network discovery tool provides automatic discovery of NTP clocks attached to network without changing PC's networking configuration.
- Configuration is saved to non-volatile memory and survives power losses.
- Encrypted network messages prevent unauthorized tampering of clock configuration.

Power Supply

- 9-28VDC input. Includes an external 12 VDC wall mount power supply with locking DC plug, UL & CE listed
- 115/220, 50/60 Hz, < 10 W Power AC Input
- Supplied with your choice of US, Euro, British or AUS/NZ plug - others optionally available

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NTP100-OSC-HS

FEATURES

- NTP Reference for Ethernet LANs in selfcontained box
- NTP time synchronized to an internal precision oven controlled crystal oscillator (OXCO) for typical stability of 1 ppb/day (< 7 sec/year) after 30 days of aging.
- NTP query (unicast), multicast, or broadcast modes
- Assignable network configuration
- Telnet or serial interface – Discovery Tools included
- Rack mountable in our RM4 or standalone
- 115/220 VAC or 9-28 VDC operation

Rack mountable with an **RM4**

SPECIFICATIONS

NTP Time Accuracy

- After initial input of time setting and 30 days aging the NTP100-OSC will typically maintain stability of 1ppb/day (<19mS/day) or <7 sec/year using an internal high precision OCXO (oven controlled crystal oscillator) and battery backed real-time clock circuit.

Outputs

- NTP reference for query (unicast), multicast, or broadcast mode – user definable

Rack Mount

- Optional rack mount kit is available - RM4

Connectors

- RJ45, 10/100 MB/sec Ethernet connection
- DC input - 2 mm jack

Physical

Size:	6.75 x 4.13 x 1.5 in 17.15 x 10.48 x 3.81 cm	**Weight:**	17.3 oz 490.5 g

Case

- Cover - off-white aluminum
- Front/rear panel - clear anodized aluminum

Setup and Control Software

- Supports DHCP/BOOTP for automatic acquisition of network address, nameservers, and time server configuration.
- Provides dynamic configuration for networking parameters.
- Configure clocks through provided network WinDiscovery tool or TELNET
- Network discovery tool provides automatic discovery of NTP clocks attached to network without changing PC's networking configuration.
- Configuration is saved to non-volatile memory and survives power losses.
- Encrypted network messages prevent unauthorized tampering of clock configuration.

Power Supply

- 9-28VDC input. Includes an external 12 VDC wall mount power supply with locking DC plug, UL & CE listed
- 115/220, 50/60 Hz, < 10 W Power AC Input
- Supplied with your choice of US, Euro, British or AUS/NZ plug - others optionally available

Operating Temperature and Humidity

- Temperature: 0 to +40°C (40 to 50°C ±1 min/year)
- Humidity: Up to 90% (non-condensing at 25°C)

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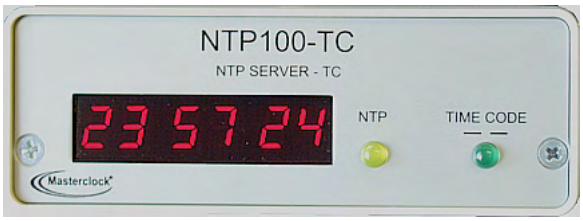
NTP100-TC



CE

FEATURES

- NTP Reference for Ethernet LANs in self-contained box
- Time synchronized to your existing IRIG or SMPTE time code source
- NTP query (unicast), multicast, or broadcast modes
- Assignable network configuration
- Telnet or serial interface - Discovery tools included
- Rack mountable in our RM4 or standalone

Rack mountable with an **RM4**

SPECIFICATIONS

NTP Time Accuracy

- When synchronized to external time code source – long term accuracy is same as external source
- With loss of time code unit will revert to internal oscillator with accuracy of better than 165 ms/day

Connectors

- RJ45, 10/100 MB/sec Ethernet connection
- DC input – 2 mm male power jack.

Setup and Control Software

- Supports DHCP/BOOTP for automatic acquisition of network address, nameservers, and timeserver configuration.
- Provides dynamic configuration for networking parameters.
- Configure clocks through provided network WinDiscovery tool or TELNET
- Network discovery tool provides automatic discovery of NTP clocks attached to network without changing PC's networking configuration.
- Configuration is saved to non-volatile memory and survives power losses.
- Encrypted network messages prevent unauthorized tampering of clock configuration.

Physical

Size:	16.25w x 6.8h x 2.1d in 41.6w x 17.4h x 5.4d cm	**Weight:**	5.1 lbs 2.3 kg

Power

- 9-28 VDC Input. Includes an external 12 VDC wall mount power supply with locking DC plug, UL & CE listed.
- 115/220 VAC, 50/60 Hz, <10W Power AC Input
- Supplied with your choice of US, Euro, British or
- AUS/NZ plug- others optionally available

Compliance

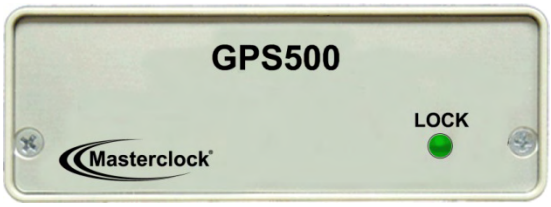
- CE Marked – Available for sale in EU
- FCC, Part 15, Class B, emissions

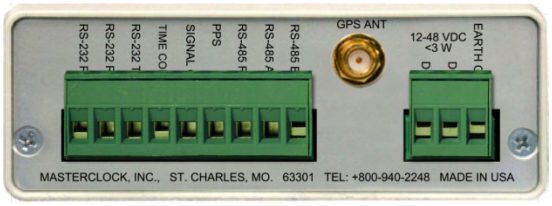
Operating Temperature and Humidity

- Temperature: 0 to +50°C
- Humidity: Up to 90% (non-condensing at 25°C)

GPS Referred Master Clock

GPS500





Rack Mountable with RM4 Adaptor

FEATURES

- Generates SMPTE / EBU or IRIG-B Time Codes
- Synchronized to atomic clocks in GPS satellites
- -11.5 to +12 hour time zone offsets in 30-minute increments
- Automatic daylight saving (North America and EU standards)
- NMEA/Kinemetrics / Truetime serial protocol output
- Wide power supply input range: 12 to 48 VDC
- Switch selectable time zone and DST
- Switch selectable interval blanking (for Schneider ION Meters®)
- Switch selectable format and baud rate

SPECIFICATIONS

Time Reference

- When synchronized a GPS500's accuracy is as accurate as a GPS satellite atomic clock
- After initial synchronization, should the GPS500 lose GPS signal it will revert to an internal TCXO oscillator and maintain an accuracy of 1 minute/year

Outputs

- SMPTE Time Code
  - SMPTE, EBU 24, 25 or 30fps
- IRIG-B Time Code
  - IRIG-B - 1 kHz modulated, level - 5 Vpp
  - IRIG-B – unmodulated, single ended 5 V
- PPS (Pulse Per second)
  - 5 V-TTL, Accuracy ± 1 us (when synchronized)
- RS-232/ASCII
  - Time code information available via RS-232
  - NMEA
  - Kinemetrics/Truetime serial protocol output
- RS-485 serial protocol output
- DATE
  - Date encoded references (IRIG 1344 and SMPTE 309M)

Rack Mount

- Optional rack mount kit is available - RM4

Connectors

- Output : 9-pin removable terminal block
- Power plug: 3-pin removable terminal block
- Antenna: SMA female

Physical

Size:	5.5 x 4.13 x 1.5 in 14 x 10.48 x 3.81 cm	**Weight:**	17.3 oz 490.5 g

Case

- Cover: Off-white aluminum
- Front/rear panel: Clear anodized aluminum

Compliance

- CE marked – Available for sale in EU [pending]
- FCC, Part 15, Class B emissions

Power Supply

- 12 VDC external wall mount supplied; UL, CE listed
- 115/220, 50/60 Hz
- Supplied with US, Euro-plug, British or AUS/NZ - others optionally available

Antenna Options

- **Basic** antenna package includes magnetic GPS antenna and 15' (5m) of cable
- **Standard** antenna package includes marine GPS antenna, mounting kit, and 50' (15m) of cable.

Operating Parameters

- Temperature: 0 to +70°C
- Humidity: Up to 90% (non-condensing at +25°C)

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FEATURES

- Generates 30 fps SMPTE, 25 fps EBU, 24 fps FILM or IRIG-B (modulated and unmodulated) time codes
- Functions as a backup time code source for master clock systems
- Can be connected to GPS-200 master clock generator to automatically synchronize to GPS atomic clock time. Upon failure or removal of GPS-200 the TCO-100 will revert to a highly stable internal crystal oscillator and continue to provide an accurate time code output.
- Internal precision crystal oscillator (TCXO) provides accuracy of ± 1 minute per year (<165 ms / day)
- 6 digit red LED time or date display on front panel
- Front panel accessible mode, date & time set switches for manual operation
- All functions can be controlled via RS-232
- -11.5 to +12 hour selectable time zone offsets - 30 min. increments
- Automatic daylight saving time adjustment (selectable) is standard for North America and available for other countries throughout the world.
- 115/220 VAC with supplied external wall mounted power supply or 9-28 VDC operation. Power supplies are available for most countries.

Rack mountable with an **RM4**

SPECIFICATIONS

I/O Connections

- Input power is 9 - 28 VDC via - 2mm female power connector
- Power consumption < 2 watts
- Supplied with wall mounted 12 VDC power supply
- Time Code Output – DB-9 male (supplied with DB-9 to BNC adapter)
- RS-232, PPS pulse - DB-9 male

Physical

Size: 5.5 x 4.13 x 1.5 in
14 x 10.48 x 3.81 cm

Weight: 16 oz
435 g

Case

- Cover - off-white aluminum
- Front/rear panel - clear anodized aluminum
- Optional rack mount

Operating Temperature and Humidity

- Temperature: 0 to +70°C
- Humidity: Up to 90% (non-condensing at +25°C)

Rack Mount Network Time Clock

NTDS16

FEATURES

- 1” (2.54cm), 6-digit LED – display colors available in amber, blue, red and green
- Syncs to external or internal NTP source for accurate traceable time
- Display time in 12- or 24-hour format or date
- Display date or alternate between time and date
- Adjustable brightness levels
- All international time zones and automatic daylight saving times
- Wireless network available on special order
- Standard chassis color is black powder coat; other colors available
- Power-over-Ethernet or worldwide AC power

SWIVEL BRACKET OPTION AVAILABLE

SPECIFICATIONS

Setup and Control Software

- Supports DHCP/BootP for automatic acquisition of network address, nameservers and time servers
- Provides dynamic configuration for networking parameters, time zone/daylight saving time
- Configure clocks through provided WinDiscovery software or TELNET
- WinDiscovery provides easy discovery and configuration of NTP clocks attached to the network without changing PC’s network configuration
- Configuration is saved to non-volatile memory
- Encrypted network messages prevent unauthorized tampering of clock configuration

Standard Rack Mount – 1RU – “Ears” removable

Size:	16.9w x 1.7h x 3.5d in 43w x 4.31h x 8.9d cm	**Weight:**	1.73 lb 0.78g

Operating Limitations

- Temperature: 0 to +60°C
- Humidity: Up to 90% (non-condensing)

Connectors

- Ethernet – RJ45
- USB connector for setup
- Small IEC connector (320-6)

Power

- Power consumption 15W
- PoE (to IEEE 802.3af standard) or
- International AC - 115/230, 50/60 Hz
- Supplied with choice of US, Euro, British or AUS/NZ power cord – others available

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Rack Mount Network Time Clock

NTDS19

FEATURES

- 1” (2.54cm), 9-digit LED – display colors available in **amber**, **blue**, **red** and **green**
- Syncs to external or internal NTP source for accurate traceable time
- Day of the Year plus display time in 12- or 24-hour format or date
- Display date or alternate between time and date
- Adjustable brightness levels
- All international time zones and automatic daylight saving times
- Wireless network available on special order
- Standard chassis color is black powder coat; other colors available
- Power-over-Ethernet or worldwide AC power

SWIVEL BRACKET OPTIONAL

SPECIFICATIONS

Setup and Control Software

- Supports DHCP/BootP for automatic acquisition of network address, nameservers and time servers
- Provides dynamic configuration for networking parameters, time zone/daylight saving time
- Configure clocks through provided WinDiscovery software or TELNET
- WinDiscovery provides easy discovery and configuration of NTP clocks attached to the network without changing PC’s network configuration
- Configuration is saved to non-volatile memory
- Encrypted network messages prevent unauthorized tampering of clock configuration

Standard Rack Mount – 1RU – “Ears” removable

Size:	16.9w x 1.7h x 3.5d in 43w x 4.31h x 8.9d cm	**Weight:**	1.73 lb 0.78g

Operating Limitations

- Temperature: 0 to +60°C
- Humidity: Up to 90% (non-condensing)

Connectors

- Ethernet – RJ45
- USB connector for setup
- Small IEC connector (320-6)

Power

- Power consumption 15W
- PoE (to IEEE 802.3af standard) or
- International AC - 115/230, 50/60 Hz
- Supplied with choice of US, Euro, British or AUS/NZ power cord – others available

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Rack Mount Network Time Clock

NTDS112

FEATURES

- 1" (2.54cm), 12-digit LED – display colors available in **amber**, **blue**, **red** and **green**
- Syncs to external or internal NTP source for accurate traceable time
- Display time in 12- or 24-hour format or date
- Display date or alternate between time and date
- Adjustable brightness levels
- All international time zones and automatic daylight saving times
- Wireless network available on special order
- Standard chassis color is black powder coat; other colors available
- Power-over-Ethernet or worldwide AC power

SWIVEL BRACKET OPTION AVAILABLE

SPECIFICATIONS

Setup and Control Software

- Supports DHCP/BootP for automatic acquisition of network address, nameservers and time servers
- Provides dynamic configuration for networking parameters, time zone/daylight saving time
- Configure clocks through provided WinDiscovery software or TELNET
- WinDiscovery provides easy discovery and configuration of NTP clocks attached to the network without changing PC's network configuration
- Configuration is saved to non-volatile memory
- Encrypted network messages prevent unauthorized tampering of clock configuration

Standard Rack Mount – 1RU – "Ears" removable

Size:	16.9w x 1.7h x 3.5d in 43w x 4.31h x 8.9d cm	**Weight:**	1.73 lb 0.78g

Operating Limitations

- Temperature: 0 to +60°C
- Humidity: Up to 90% (non-condensing)

Connectors

- Ethernet – RJ45
- USB connector for setup
- Small IEC connector (320-6)

Power

- Power consumption 15W
- PoE (to IEEE 802.3af standard) or
- International AC - 115/230, 50/60 Hz
- Supplied with choice of US, Euro, British or AUS/NZ power cord – others available

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Masterclock®

NTP Driven Clocks 3.2.1

NTDS24

FEATURES

- 2.3" (*5.8cm*), 4 digit LED – display colors available in **red**, **green**, **amber**, and **blue**
- Syncs to external or internal NTP source for accurate traceable time
- Display time in 12 or 24 hr format – hh:mm
- Display date, or alternate between time and date – dd:MM or MM:dd
- Adjustable brightness levels
- All international time zones and automatic daylight saving times
- Wireless network available on special order
- Standard chassis colors are black or beige (off-white) powder coat
- Power-over-Ethernet or worldwide AC Power
- CE marked for sale in EU – FCC, Class B, Emissions

MOUNTING BRACKETS

Wall Mount Bracket Included	
Tilt Wall Bracket Option	
Flush Mount Bracket Option	
Dual Face Ceiling Mount Option (see 3.6)	

SPECIFICATIONS

Setup and control software

- Supports DHCP/BOOTP for automatic acquisition of network address, nameservers, and time server configuration
- Provides dynamic configuration for networking parameters, time zone/daylight saving time
- Configure clocks through provided WinDiscovery software or TELNET
- WinDiscovery provides easy discovery and configuration of NTP clocks attached to the network without changing PC's network configuration
- Configuration is saved to non-volatile memory
- Encrypted network messages prevent unauthorized tampering of clock configuration

Physical

Powder-coated, non-rusting, welded steel chassis

Size:	10.1w x 3.75h x 1.57d in 25.7w x 9.6h x 4d cm	**Weight:**	2.1 lbs 0.9 kg

Connectors

- Ethernet – RJ45
- USB connector for setup (option)
- 2.1mm locking DC input jack (DC option)

Power

- Power consumption 15W
- PoE (to IEEE 802.3af standard) or
- AC option
  - Includes external AC to DC wall-mount power supply with locking DC plug
  - International AC – 115/230, 50/60 Hz
  - Supplied with your choice of US, Euro, British or AUS/NZ plug – others available

Operating Temperature and Humidity

- Temperature: 0 to +60°C
  (0 to +40°C, ±1 min/year for standard TCXO)
- Humidity: Up to 90%, non-condensing

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NTP Driven Clocks 3.2.2

NTDS26

MOUNTING BRACKETS

Wall Mount Bracket -or- Bracket for 19" 2U Rack (please specify)	
Tilt Wall Bracket Option	
Flush Mount Bracket Option	
Dual Face Ceiling Mount Option (see 3.7)	

FEATURES

- 2.3" (*5.8cm*), 6 digit LED – display colors available in **red**, **green**, **amber**, and **blue**
- Syncs to external or internal NTP source for accurate traceable time
- Display time in 12 or 24 hr format – hh:mm:ss
- Display date - MM:dd:yy or dd:MM:yy or yy:MM:dd – configurable
- Adjustable brightness levels
- All international time zones and automatic daylight saving times
- Wireless network available on special order
- Standard chassis colors are black or beige (off-white) powder coat
- Power-over-Ethernet or worldwide AC Power
- CE marked for sale in EU – FCC, Class B, Emissions
- **New! Dry Contact Relay Option** - Upon loss of lock from NTP source NO/NC dry contact relay inside the clock is energized - Contact factory

SPECIFICATIONS

Setup and control software

- Supports DHCP/BOOTP for automatic acquisition of network address, nameservers, and time server configuration
- Provides dynamic configuration for networking parameters, time zone/daylight saving time
- Configure clocks through provided WinDiscovery software or TELNET
- WinDiscovery tool provides automatic discovery of NTP clocks attached to network without changing PC's network configuration
- Configuration is saved to non-volatile memory
- Encrypted network messages prevent unauthorized tampering of clock configuration

Physical

Powder-coated, non-rusting, welded steel chassis

Size:	16.9w x 3.43h x 3d in 43w x 8.7h x 7.6d cm	**Weight:**	3.85 lbs 1.7 kg

Connectors

- Ethernet – RJ45
- USB connector for setup (option)
- 2.1mm locking DC input jack (DC option)

Power

- Power consumption 15W
- PoE (to IEEE 802.3af standard) or
- AC option - International 115/230, 50/60 Hz
  - Supplied with your choice of US, Euro, British or AUS/NZ power cord – others available
- DC option
  - Includes external AC to DC wall-mount power supply with locking DC plug
  - International AC – 115/230, 50/60 Hz
  - Supplied with your choice of US, Euro, British or AUS/NZ plug – others available

Operating Temperature and Humidity

- Temperature: 0 to +60°C
  (0 to +40°C, ±1 min/year for standard TCXO)
- Humidity: Up to 90%, non-condensing

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NTP Driven Clocks 3.2.3

NTDS29

FEATURES

- 1.8" (*4.6cm*), 9 digit LED – display colors available are **red** with **green** and **amber** on special order.
- Syncs to external or internal NTP source for accurate traceable time
- Three digit *Day of Year* display
- Six digit Time display in 12 or 24 hour format – hh:mm:ss
- Wireless network available on special order
- All international time zones and automatic daylight saving times
- Standard chassis colors are black or beige (off-white) powder coat
- Power-over-Ethernet or worldwide AC Power
- CE marked for sale in EU – FCC, Class B, Emissions (pending)
- **New! Dry Contact Relay Option** - Upon loss of lock from NTP source NO/NC dry contact relay inside the clock is energized - Contact factory

MOUNTING BRACKETS

Rack Mount Bracket for 19" 2U Rack -or- Wall Mount Bracket Option (please specify)	
Tilt Wall Bracket Option	

SPECIFICATIONS

Setup and control software

- Supports DHCP/BOOTP for automatic acquisition of network address, nameservers, and time server configuration
- Provides dynamic configuration for networking parameters, time zone/daylight saving time
- Configure clocks through provided WinDiscovery software or TELNET
- WinDiscovery provides easy discovery and configuration of NTP clocks attached to network without changing PC's network configuration
- Configuration is saved to non-volatile memory and survives power losses
- Encrypted network messages prevent unauthorized tampering of clock configuration

Physical

Powder-coated, non-rusting, welded steel chassis

Size: 17.5w x 3.75h x 3.0d in
44.5w x 9.6h x 7.6d cm

Weight: 3.2 lbs
1.4 kg

Connectors

- Ethernet – RJ45
- USB connector for setup (option)
- 2.1mm locking DC input jack (DC option)
- IEC connector (AC option)

Power

- Power consumption 15W
- PoE (to IEEE 802.3af standard) or
- AC option - International 115/230, 50/60 Hz
  - Supplied with your choice of US, Euro, British or AUS/NZ power cord – others available
- DC option
  - Includes external AC to DC wall-mount power supply with locking DC plug
  - International AC – 115/230, 50/60 Hz
  - Supplied with your choice of US, Euro, British or AUS/NZ plug – others available

Operating Temperature and Humidity

- Temperature: 0 to +60°C
  (0 to +40°C, ±1 min/year for TCXO)
- Humidity: Up to 90%, non-condensing

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NTP Driven Clocks 3.3.1

NTDS44

FEATURES

- 4" (*10.2cm*), 4 digit LED – display colors available in **red**, **green**, **amber**, and **blue**
- Syncs to external or internal NTP source for accurate traceable time
- Display time in 12 or 24 hr format – hh:mm
- Display date, or alternate between time and date – dd:MM or MM:dd
- Adjustable brightness levels
- All international time zones and automatic daylight saving times
- Wireless network available on special order
- Standard chassis colors are black or beige (off-white) powder coat
- Power-over-Ethernet or worldwide DC Power
- CE marked for sale in EU – FCC, Class B, Emissions (pending)

MOUNTING BRACKETS

Wall Mount Bracket Included	
Tilt Wall Bracket Option	
Flush Mount Bracket Option	
Dual Face Ceiling Mount Option (see 3.7)	

SPECIFICATIONS

Setup and control software

- Supports DHCP/BOOTP for automatic acquisition of network address, nameservers, and time server configuration
- Provides dynamic configuration for networking parameters, time zone/daylight saving time
- Configure clocks through provided WinDiscovery software or TELNET
- WinDiscovery provides easy discovery and configuration of NTP clocks attached to network without changing PC's network configuration
- Configuration is saved to non-volatile memory
- Encrypted network messages prevent unauthorized tampering of clock configuration

Physical

Powder-coated, non-rusting, welded steel chassis

Size: 16.25w x 6.8h x 2.1d in
41.6w x 17.4h x 5.4d cm

Weight: 5.1 lbs
2.3 kg

Connectors

- Ethernet – RJ45
- USB connector for setup (option)
- 2.1mm locking DC input jack (DC option)

Power

- PoE (to IEEE 802.3af standard)
- DC option
  - Includes power supply with locking DC plug
  - Supplied with your choice of US, Euro, British or AUS/NZ plug – others available

Operating Temperature and Humidity

- Temperature: 0 to +60°C
  (0 to +40°C, ±1 min/year for standard TCXO)
- Humidity: Up to 90%, non-condensing

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NTP Driven Clocks 3.3.2

NTDS46

FEATURES

- 4" (*10.2cm*), 6 digit LED – display colors available in **red**, **green**, **amber**, and **blue**
- Syncs to external or internal NTP source for accurate traceable time
- Display time in 12 or 24 hr format – hh:mm:ss
- Display date - MM:dd:yy or dd:MM:yy or yy:MM:dd – configurable
- Adjustable brightness levels
- All international time zones and automatic daylight saving times
- Wireless network available on special order
- Standard chassis colors are black or beige (off-white) powder coat
- PoE, AC or DC input
- CE marked for sale in EU – FCC, Class B, Emissions (pending)

2.3" Seconds Option

MOUNTING BRACKETS

Wall Mount Bracket Included	
Tilt Wall Bracket Option	
Dual Face Ceiling Mount Option (see 3.7)	

SPECIFICATIONS

Setup and control software

- Supports DHCP/BOOTP for automatic acquisition of network address, nameservers, and time server configuration
- Provides dynamic configuration for networking parameters, time zone/daylight saving time
- Configure clocks through provided WinDiscovery software or TELNET
- WinDiscovery provides easy discovery and configuration of NTP clocks attached to the network without changing PC's network configuration
- Configuration is saved to non-volatile memory
- Encrypted network messages prevent unauthorized tampering of clock configuration

Physical

Powder-coated, non-rusting, welded steel chassis

Size: 25w x 6.8h x 2.1d in
63.3w x 17.4h x 5.4d cm

Weight: 7.6 lbs
3.5 kg

Connectors

- RJ45 - Ethernet
- USB connector for setup (option)
- 2.1mm locking DC input jack (DC option)

Power Options

- Power consumption 15W
- PoE (to IEEE 802.3af standard) or
- AC input, IEC power cord
- DC input with wall wart (transformer)
  - International AC – 115/230, 50/60 Hz
  - Supplied with your choice of US, Euro, British or AUS/NZ plug – others available

Operating Temperature and Humidity

- Temperature: 0 to +60°C
  (0 to +40°C, ±1 min/year for standard TCXO)
- Humidity: Up to 90%, non-condensing

Dry Contact Relay Option New!

- Upon loss of lock from NTP source NO/NC dry contact relay inside the clock is activated.

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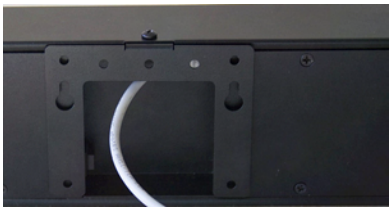
NTP Driven Clocks 3.4.1

NTDS84



FEATURES

- 7" (*18cm*), 4 digit LED – display colors available in **red** and **blue**
- Syncs to external or internal NTP source for accurate traceable time
- Display time in 12 or 24 hr format – hh:mm
- Display date, or alternate between time and date – dd:MM or MM:dd
- Adjustable brightness levels
- Wireless network available on special order
- All international time zones and automatic daylight saving times
- Standard chassis colors are black or beige (off-white) powder coat
- Power-over-Ethernet or worldwide AC Power
- CE marked for sale in EU – FCC, Class B, Emissions (pending)

MOUNTING BRACKETS

Wall Mount Bracket Included	
Tilt Wall Bracket Option	

SPECIFICATIONS

Setup and control software

- Supports DHCP/BOOTP for automatic acquisition of network address, nameservers, and time server configuration
- Provides dynamic configuration for networking parameters, time zone/daylight saving time
- Configure clocks through provided WinDiscovery software or TELNET
- WinDiscovery provides easy discovery and configuration of NTP clocks attached to the network without changing PC's network configuration
- Configuration is saved to non-volatile memory
- Encrypted network messages prevent unauthorized tampering of clock configuration

Physical

Powder-coated, non-rusting, welded steel chassis

Size: 25.51w x 9.75h x 2.63d in
64.8w x 24.77h x 6.68d cm

Weight: 6.2 lbs
2.8 kg

Connectors

- Ethernet – RJ45
- USB connector for setup (option)
- 2.1mm locking DC input jack (DC option)

Power

- Power consumption 15W
- PoE (to IEEE 802.3af standard) or
- AC option - International 115/230, 50/60 Hz
  - Supplied with your choice of US, Euro, British or AUS/NZ power cord – others available
- DC option
  - Includes external AC to DC wall-mount power supply with locking DC plug
  - International AC – 115/230, 50/60 Hz
  - Supplied with your choice of US, Euro, British or AUS/NZ plug – others available

Operating Temperature and Humidity

- Temperature: 0 to +60°C
  (0 to +40°C, ±1 min/year for standard TCXO)
- Humidity: Up to 90%, non-condensing

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NTP Driven Clocks 3.4.2

NTDS86

FEATURES

- 7" (*18cm*), 6 digit LED – display colors available in **red** and **blue**
- Syncs to external or internal NTP source for accurate traceable time
- Display time in 12 or 24 hr format – hh:mm:ss
- Display date - MM:dd:yy or dd:MM:yy or yy:MM:dd – configurable
- Adjustable brightness levels, Visible up to 350ft - 100 meters
- All international time zones and automatic daylight saving times
- Wireless network available on special order
- Standard chassis colors are black or beige (off white) powder coat
- Power-over-Ethernet or worldwide AC Power
- CE marked for sale in EU – FCC, Class B, Emissions (pending)
- **New! Dry Contact Relay Option** - Upon loss of lock from NTP source NO/NC dry contact relay inside the clock is energized - Contact factory

*PoE not available on Dual Face model.

MOUNTING BRACKETS

Wall Mount Bracket Included	
Tilt Wall Bracket Option	

Dual Face Ceiling Mount Option (see 3.7)

SPECIFICATIONS

Setup and control software

- Supports DHCP/BOOTP for automatic acquisition of network address, nameservers, and time server configuration
- Provides dynamic configuration for networking parameters, time zone/daylight saving time
- Configure clocks through provided WinDiscovery software or TELNET
- WinDiscovery tool provides easy discovery and configuration of NTP clocks attached to the network without changing PC's network configuration
- Configuration is saved to non-volatile memory
- Encrypted network messages prevent unauthorized tampering of clock configuration

Physical

Powder-coated, non-rusting, welded steel chassis

Size:	37.3w x 9.8h x 2.6d in 94.8w x 24.8h x 6.7d cm	**Weight:**	10.6 lbs 4.8 kg

Connectors

- Ethernet – RJ45
- USB connector for setup (option)
- 2.1mm locking DC input jack (DC option)

Power

- Power consumption 15W
- PoE (to IEEE 802.3af standard) or
- AC option - International 115/230, 50/60 Hz
  - Supplied with your choice of US, Euro, British or AUS/NZ power cord – others available
- DC option
  - Includes external AC to DC wall-mount power supply with locking DC plug
  - International AC – 115/230, 50/60 Hz
  - Supplied with your choice of US, Euro, British or AUS/NZ plug – others available

Operating Temperature and Humidity

- Temperature: 0 to +60°C
  (0 to +40°C, ±1 min/year for standard TCXO)
- Humidity: Up to 90%, non-condensing

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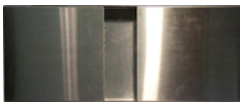
NTP Driven Clocks 3.5.1

NTDS4626

FEATURES

- Time and date display with 6 - 4" (*10.2cm*) digits and 6 - 2.3" (*5.8cm*) digits
- Display colors available in **red**, **green**, **amber**, or **blue**
- Syncs to external or internal NTP source for accurate traceable time
- Display time in 12 or 24 hr format – hh:mm:ss
- Display date in dd:MM:yy, MM:dd:yy, or yy:MM:dd
- Adjustable brightness levels
- All international time zones and automatic daylight saving times
- Standard chassis is brushed stainless steel. Black powder coat is also available
- Power over Ethernet (PoE) or Worldwide AC Power



Rear view

SPECIFICATIONS

Setup and control software

- Supports DHCP/BOOTP for automatic acquisition of network address, nameservers, and time server configuration
- Provides dynamic configuration for networking parameters, time zone/daylight saving time
- Configure clocks through provided WinDiscovery software or TELNET
- WinDiscovery tool provides easy discovery and configuration of NTP clocks attached to the network without changing PC's network configuration
- Configuration is saved to non-volatile memory
- Encrypted network messages prevent unauthorized tampering of clock configuration

Physical

Powder-coated, non-rusting, welded steel chassis

Size:	25.5w x 10.15h x 2.75d in 64.8w x 25.77h x 7d cm	**Weight:**	9.6 lbs 4.35 kg

Connectors

- Ethernet – RJ45
- Optional AC input - IEC connector

Power

- Power consumption 15W
- PoE (to IEEE 802.3af standard) or
- AC option - International 90-264 VAC, 47-63 Hz
  - Supplied with your choice of US, Euro, British or AUS/NZ power cord – others available
- DC option
  - Includes external AC to DC wall-mount power supply with locking DC plug
  - International AC – 115/230, 50/60 Hz
  - Supplied with your choice of US, Euro, British or AUS/NZ plug – others available

Operating Temperature and Humidity

- Temperature: 0 to +60°C
  (0 to +40°C, ±1 min/year for standard TCXO)
- Humidity: Up to 90%, non-condensing

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NTP Driven Clocks 3.5.2

NTDS4626-3AL

Stainless Steel Chassis

Black Powder Coat Chassis

FEATURES

- Time and date display with 6 - 4" (*10.2cm*) digits, 6 - 2.3" (*5.8cm*) digits and 3 alphanumeric digits – display colors available in **red**, **green**, **amber**, or **blue.**
- Syncs to external or internal NTP source for accurate traceable time
- Display time in 12 or 24 hr format – hh:mm:ss
- Display date - MM:dd:yy or dd:MM:yy or yy:MM:dd – configurable
- Alphanumeric digits display month or day of week
- Adjustable brightness levels
- All international time zones and automatic daylight saving times
- Wireless network available on special order
- Stainless steel, black, or white powder coat chassis
- Worldwide AC power options
- CE marked for sale in EU – FCC, Class B, Emissions (pending)

MOUNTING BRACKETS

Wall Mount Bracket Included	

DAY OF WEEK AVAILABLE IN 7 LANGUAGES

English, French, German, Italian, Portuguese, Russian, and Spanish

SPECIFICATIONS

Setup and control software

- Supports DHCP/BOOTP for automatic acquisition of network address, nameservers, and time server configuration
- Provides dynamic configuration for networking parameters, time zone/daylight saving time
- Configure clocks through provided WinDiscovery software or TELNET
- WinDiscovery provides easy discovery and configuration of NTP clocks attached to the network without changing PC's network configuration
- Configuration is saved to non-volatile memory
- Encrypted network messages prevent unauthorized tampering of clock configuration

Physical

Powder-coated, non-rusting, welded steel chassis

Size:	25.5w x 10.15h x 2.75d in 64.8w x 25.77h x 7d cm	**Weight:**	9.6 lbs 4.35 kg

Connectors

- RJ45 – Ethernet (and PoE option)
- AC IEC – AC power input

Power

- Power consumption 15W
- AC option - International 90-264 VAC, 47-63 Hz
  - Supplied with your choice of US, Euro, British or AUS/NZ power cord – others available
- Power over Ethernet option – available with most color combinations – contact factory for details.

Operating Temperature and Humidity

- Temperature: 0 to +60°C
  (0 to +40°C, ±1 min/year for standard TCXO)
- Humidity: Up to 90%, non-condensing

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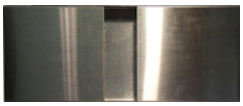
NTP Driven Clocks 3.5.3

NTDS8646SS

FEATURES

- Time and date display with 6 - 7" (*18cm*) digits and 6 - 4" (*10.2cm*) digits
- Display colors available in **red**, **green**, **amber**, or **blue**
- Syncs to external or internal NTP source for accurate traceable time
- Display time in 12 or 24 hr format – hh:mm:ss
- Display date in dd:MM:yy, MM:dd:yy, or yy:MM:dd
- Adjustable brightness levels
- All international time zones and automatic daylight saving times
- Standard chassis is burnished stainless steel
- Worldwide AC power options



Rear view

SPECIFICATIONS

Setup and control software

- Supports DHCP/BOOTP for automatic acquisition of network address, nameservers, and time server configuration
- Provides dynamic configuration for networking parameters, time zone/daylight saving time
- Configure clocks through provided WinDiscovery software or TELNET
- WinDiscovery provides easy discovery and configuration of NTP clocks attached to the network without changing PC's network configuration
- Configuration is saved to non-volatile memory
- Encrypted network messages prevent unauthorized tampering of clock configuration

Physical

Powder-coated, non-rusting, welded steel chassis

Size:	39.4w x 15h x 2.6d in 100.4w x 38.1h x 6.7d cm	**Weight:**	25 lbs 11.3 kg

Connectors

- Ethernet – RJ45
- Optional AC input - IEC connector

Power

- Power consumption 15W
- AC power - International 90-264 VAC, 47-63 Hz
  - Supplied with your choice of US, Euro, British or AUS/NZ power cord – others available

Operating Temperature and Humidity

- Temperature: 0 to +60°C
  (0 to +40°C, ±1 min/year for standard TCXO)
- Humidity: Up to 90%, non-condensing

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NTP Driven Clocks 3.6.1

CLKNTD12

Standard 12 Hour Faceplate

12/24 Hour Option

True 24 Hour Option

CE

FEATURES

- Uses external (or your own internal) NTP source for accurate time traceable to NIST
- All international time zones
- Daylight saving time – available and configurable for all countries
- Uses standard Ethernet wiring
- Utilizes microprocessor controlled stepper motor
- Sweep second hand
- Universal AC input voltage & frequency
- Optional PoE (Power over Ethernet)
- Internal crystal and clock chip
- LED Status Indicator
- Standard chassis colors available are black or beige (off-white) powder coat or stainless steel
- Other colors available with minimum order; contact factory for details

Dual Face Available
(See 3.7)

Illuminated Face Option

SPECIFICATIONS

Setup and control software

- Supports DHCP/BOOTP for automatic acquisition of network address, nameservers, and time server configuration
- NTP synchronization options and more
- Provides dynamic configuration for networking parameters, time zone/daylight saving time
- Configure clocks through provided network discovery tool or TELNET
- Network discovery tool provides automatic discovery of NTP clocks attached to network without changing PC's network configuration
- Configuration is saved to non-volatile memory and survives power losses
- Encrypted network messages prevent unauthorized tampering of clock configuration

Physical

- 12.5" (*31.8cm*) round black metal case with polycarbonate lens/crystal, 4.25" (*10.8cm*) high
- Surface / wall mount bracket provided
- Weight – 7.6 lbs (*3.45kg*)
- Optional 24hr face available

Power

- 90-265 VAC 50/60 Hz
- IEC AC power connector and cord
- Specify US, UK, EURO, or AUS/NZ plugs
- PoE (Power over Ethernet) option available
- < 12.95W power consumption

Compliance

- CE Marked - available for sale in EU
- FCC, Class B, Emissions

Operating Temperature and Humidity

- Temperature: 0 to +50°C
- Humidity: Up to 90% (non-condensing at +25°C)

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NTP Driven Clocks 3.6.2

CLKNTD15

CE

FEATURES

- 14.9” (37.85cm) analog clock
- Uses external (or your own internal) NTP source for accurate time traceable to NIST
- All international time zones
- Daylight saving time – available and configurable for all countries
- Uses standard Ethernet wiring
- Utilizes microprocessor controlled stepper motor
- Sweep second hand
- Universal AC input voltage & frequency
- Optional PoE (Power over Ethernet)
- Internal crystal and clock chip
- LED Status Indicator
- Standard chassis colors available are black or beige powder coat or stainless steel
- Other colors available with minimum order; contact factory for details
- 12/24 hour, true 24 hour, and arabic faces also available

For a limited time only!
Chocolate Brown
Powder Coat

SPECIFICATIONS

Setup and control software

- Supports DHCP/BOOTP for automatic acquisition of network address, nameservers, and time server configuration
- NTP synchronization options and more
- Provides dynamic configuration for networking parameters, time zone/daylight saving time
- Configure clocks through provided network discovery tool or TELNET
- Network discovery tool provides automatic discovery of NTP clocks attached to network without changing PC’s network configuration
- Configuration is saved to non-volatile memory and survives power losses
- Encrypted network messages prevent unauthorized tampering of clock configuration

Physical

- 14.9” (*37.85cm*) round black metal case with polycarbonate lens/crystal, 4.075” (*10.35cm*) high
- Surface / wall mount bracket provided
- Weight – 6.2 lbs (*2.81kg*)
- Optional 24hr face available

Power

- 90-265 VAC 50/60 Hz
- IEC AC power connector and cord
- Specify US, UK, EURO, or AUS/NZ plugs
- PoE (Power over Ethernet) option available
- < 12.95W power consumption

Compliance

- CE Marked - available for sale in EU
- FCC, Class B, Emissions

Operating Temperature and Humidity

- Temperature: 0 to +50°C
- Humidity: Up to 90% (non-condensing at +25°C)

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NTP Driven Clocks 3.6.3

CLKNTD18-SS

CE

Standard Faceplate

Tick Mark Faceplate Option

FEATURES

- Large 18” (*45 cm*) clock for easy viewing
- Uses external (or your own internal) NTP source for accurate time traceable to NIST
- All international time zones
- Daylight saving time – available and configurable for all countries
- Uses standard Ethernet wiring
- Utilizes microprocessor controlled stepper motor
- Sweep second hand
- Universal AC input voltage & frequency
- Optional PoE (Power over Ethernet)
- Internal crystal and clock chip
- LED Status Indicator
- Deluxe handmade stainless steel chassis

SPECIFICATIONS

Setup and control software

- Supports DHCP/BOOTP for automatic acquisition of network address, nameservers, and time server configuration
- NTP synchronization options and more
- Provides dynamic configuration for networking parameters, time zone/daylight saving time
- Configure clocks through provided network discovery tool or TELNET
- Network discovery tool provides automatic discovery of NTP clocks attached to network without changing PC’s network configuration
- Configuration is saved to non-volatile memory and survives power losses
- Encrypted network messages prevent unauthorized tampering of clock configuration

Operating Temperature and Humidity

- Temperature: 0 to +40°C
- Humidity: Up to 90% (non-condensing at +25°C)

Physical

- 18” (*45cm*) round black metal case with polycarbonate lens/crystal, 4.25” (*10.8cm*) high
- Surface / wall mount bracket provided
- Weight – 11.4 lbs (*5.1kg*)
- Optional 24hr face available
- Optional tick mark face available

Power

- 90-265 VAC 50/60 Hz
- IEC AC power connector and cord
- Specify US, UK, EURO, or AUS/NZ plugs
- PoE (Power over Ethernet) option available
- < 12.95W power consumption

Compliance

- CE Marked - available for sale in EU
- FCC, Class B, Emissions

Masterclock, Inc.

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NTP Driven Clocks 3.6.4

CLKNTD30

FEATURES

- 30” - 76cm burnished stainless steel clock
- Uses external (or your own internal) NTP source for accurate time traceable to NIST
- All international time zones
- Daylight saving time – available and configurable for all countries
- Uses standard Ethernet wiring
- Utilizes microprocessor controlled stepper motor for rapid, reliable, accurate, and quiet operation
- Universal AC input voltage & frequency
- Optional PoE (Power over Ethernet)
- Internal crystal and clock chip
- LED Status Indicator
- Deluxe handmade stainless steel chassis

CE

SPECIFICATIONS

Setup and control software

- Supports DHCP/BOOTP for automatic acquisition of network address, nameservers, and time server configuration
- NTP synchronization options and more
- Provides dynamic configuration for networking parameters, time zone/daylight saving time
- Configure clocks through provided network discovery tool or TELNET
- Network discovery tool provides automatic discovery of NTP clocks attached to network without changing PC’s network configuration
- Configuration is saved to non-volatile memory and survives power losses
- Encrypted network messages prevent unauthorized tampering of clock configuration

Operating Temperature and Humidity

- Temperature: 0 to +40°C
- Humidity: Up to 90% (non-condensing at +25°C)

Physical

- 30” - 76cm diameter, 3.3” - 8.38cm deep burnished stainless steel case with flat acrylic UV stable lens/crystal
- Also available in black or white powder coat
- Surface / wall mount bracket provided
- Weight - 31.28 lbs - 14.19 kg
- Optional 24hr face available
- Optional tick mark face available

Power

- 90-265 VAC 50/60 Hz
- IEC AC power connector and cord
- Specify US, UK, EURO, or AUS/NZ plugs
- PoE (Power over Ethernet) option available
- < 12.95W power consumption

Compliance

- CE Marked - available for sale in EU
- FCC, Class B, Emissions

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Digital Clocks

4 Digit

NTDS24DF	**Size:**	10.3w x 7h x 3.5d in 25.9w x 17.8h x 8.4d cm	**Weight:**	4 lbs 1.8 kg
NTDS44DF	**Size:**	15.75w x 9.5h x 3.5d in 40w x 24h x 9d cm	**Weight:**	8.6 lbs 3.9 kg
NTDS84DF*	**Size:**	26w x 10h x 4.5d in 66w x 25.4h x 11.4 cm	**Weight:**	11.7 lbs 5.3 kg

6 Digit

NTDS26DF	**Size:**	15.5w x 7h x 3.5d in 39.5w x 18h x 9d cm	**Weight:**	6 lbs 2.7 kg
TCDS26DF	**Size:**	15.5w x 7h x 3.5d in 39.5w x 18h x 9d cm	**Weight:**	6 lbs 2.7 kg
NTDS46DF	**Size:**	25w x 9.5h x 3.5d in 64w x 24.1h x 9d cm	**Weight:**	11.5 lbs 5.2 kg
NTDS86DF	**Size:**	38w x 10h x 4.5d in 96.5w x 25.4h x 11.4 cm	**Weight:**	20 lbs 9.1 kg

Analog Clocks

CLKNTD12	**Size:**	12.5 dia. x 6 depth in 31.8 dia. x 15.2 depth cm	**Weight:**	11 lbs 5 kg
CLKTCD12	**Size:**	12.5 dia. x 6 depth in 31.8 dia. x 15.2 depth cm	**Weight:**	11 lbs 5 kg

*Availability subject to minimum order of 25.

Masterclock®

Timer Controller 3.8

RC500

FEATURES

- Provides remote Up/Down timer control for **NTDS** and **TCDS** clocks
- Functions include
  - count down timer
  - count up timer (stopwatch or limit)
  - clock
- Illuminated buttons indicated function currently in use
- Six digit LED display shows the display on the remote clock(s)
- Controls one or multiple clocks (up to 6 time code, unlimited NTP) simultaneously for like events (up/down, starting and stopping simultaneously)
- Ethernet network communication to NTDS clocks
- RS485 communication to TCD clocks
- Power over Ethernet (PoE) option

SPECIFICATIONS

Controls

- Illuminated buttons for Mode Select (count up, count down, clock) and Action (start/pause/reset)

Output

- Ethernet timer control packets for NTDS clocks
- RS485 serial output for time code clocks

Physical

- Rubber feet for tabletop use
- Stainless steel or black powder coat chassis

Size: 6.82w x 5.24h x 2.37d in
17.32w x 13.31h x 6.02d cm

Power Options

- AC input (100 - 240 VAC, 50/60 Hz) - Standard
- PoE input (48 VDC, IEEE 802.3af standard)

Interface

- RJ45 (Ethernet)
- RJ12 (RS485)
- SMA RF Antenna option

Compliance

- CE Marked - Available for sale in EU
- FCC, Class B Part 15, Emissions

Operating Temperature and Humidity

- Temperature: 0 to +40°C
- Humidity: Up to 90% (non-condensing at +25°C)

Time Code Interfacing Accessories

2-way RJ12 splitter

6-way RJ12 splitter

6P6C Cable

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Time Code Driven Clocks 4.1

TCD200

FEATURES

- 6 each, .6" – 1.5 cm digits, 7 segment LED – display colors available in **red**, **green**, and **amber**
- Syncs to IRIG-B, SMPTE, EBU (also 24 fps film and drop frame) time codes
- 24 or 12 hour time display – PM indicator
- Time display - hh:mm:ss
- Date display - MM:dd:yy - or - dd:MM:yy – internal switch configurable
- -11.5 to +12 hour, time zone offsets in 30 min increments
- Daylight saving time - US & Canada standard
- Brightness control - 4 levels - switch configurable
- All functions are controllable via RS-232
- Automatic input level control
- Automatic time code type detection
- With loss of time code unit will revert to internal clock until time code is regained and then automatically re-sync to time code when available

SPECIFICATIONS

Counter Mode

- Up/down counter mode - start count is initiated with closure between two contacts on DB-9 connector

Connectors

- Time code input - BNC
- DC input connector is 2.1 mm male DC power plug
- DB-9 male, RS-232 control, counter start / stop contacts (not compatible with RC200/RC500)

Physical

Size: 4.2w x 1.5h x 5.5d in
10.6w x 3.8h x 14d cm

Weight: 16 oz
435 g

Case

- Cover - off-white aluminum
- Front/rear panel - clear anodized aluminum

Rack Mount

- Optional rack mount kit is available - RM4

Power

- 12 - 28 VDC input
- Wall mounted 12 VDC power supply is provided
- 120 / 240 VAC, please specify: US, EURO, UK or AUS power plug
- Power consumption < 5W
- Power supply has UL, CSA, IEC, EN, VDE & CE approval

Operating Temperature and Humidity

- Temperature: 0 to +40°C
- Humidity: Up to 90% (non-condensing at +25°C)

IEEE Standard 1344 - Compliant

Reads and displays year and date/time information in IRIG-B control bits.

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Rack Mount Time Code Clock

TCDS16

FEATURES

- 1” (2.54cm), 6 digit LED – display colors available in **amber**, **blue**, **red** and **green**
- Automatically detects and syncs to **IRIG-B** or **SMPTE**, **EBU** non-drop frame time codes
- Six-digit time display in 12- or 24-hour format or date
- All international time zones and automatic daylight saving times
- Standard chassis color is black powder coat; other colors available
- Universal worldwide AC power
- Count down or count up capable (using RC500)
- CE marked for sale in EU – FCC, class B, emissions (pending)

SWIVEL BRACKET OPTION AVAILABLE

SPECIFICATIONS

Setup and Control Software

- Configure clocks through USB serial interface
- Configuration utility running under Microsoft Windows Operating Systems XP or better
- World-wide time zone and DST support– no configuration switches
- Up/down timer mode – controlled with RC500 via RS-485 port
- Configuration is saved to non-volatile memory and survives power losses

Standard Rack Mount – 1RU – “Ears” removable

Size:	16.9w x 1.7h x 4.5d	in	**Weight:**	1.0	lb
	43w x 4.31h x 11.5d	cm		0.45	kg

Operating Limitations

- Temperature: 0 to +60°C
- Humidity: Up to 90% (non-condensing)

Connectors

- BNC female – Unbalanced TC input
- Terminal block – 3 position, balanced TC input
- USB connector for setup
- Small IEC connector (320-6)

Power

- Power consumption < 15W
- International 115/230, 50/60 Hz
- Supplied with choice of US, Euro, British or AUS/NZ power cord – others available

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Rack Mount Time Code Clock

TCDS19

FEATURES

- 1” (2.54cm), 9-digit LED – display colors available in **amber**, **blue**, **red** and **green**
- Automatically detects and syncs to **IRIG-B** or **SMPTE**, **EBU** non-drop frame time codes
- Nine-digit time display in 12- or 24-hour format with day of year
  doy hh:mm:ss
- All international time zones and automatic daylight saving times
- Standard chassis color is black powder coat; other colors available
- Universal worldwide AC power
- Count down or count up capable (using RC500)
- CE marked for sale in EU – FCC, class B, emissions (pending)

SWIVEL BRACKET OPTION AVAILABLE

SPECIFICATIONS

Setup and Control Software

- Configure clocks through USB serial interface
- Configuration utility running under Microsoft Windows Operating Systems XP or better
- World-wide time zone and DST support– no configuration switches
- Up/down timer mode – controlled with RC500 via RS-485 port.
- Configuration is saved to non-volatile memory and survives power losses

Standard Rack Mount – 1RU – “Ears” removable

Size:	16.9w x 1.7h x 4.5d	in	**Weight:**	1.0	lb
	43w x 4.31h x 11.5d	cm		0.45	kg

Operating Limitations

- Temperature: 0 to +60°C
- Humidity: Up to 90% (non-condensing)

Connectors

- BNC female – Unbalanced TC input
- Terminal block – 3 position, balanced TC input
- USB connector for setup
- Small IEC connector (320-6)

Power

- Power consumption < 15W
- International 115/230, 50/60 Hz
- Supplied with choice of US, Euro, British or AUS/NZ power cord – others available

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Rack Mount Time Code Clock

TCDS112

FEATURES

- 1” (2.54cm), 12-digit LED – Display colors available in **amber**, **blue**, **red** and **green**
- Automatically detects and syncs to **IRIG-B** or **SMPTE**, **EBU** non-drop frame time codes
- Two 6-digit displays to show time and date (mm:dd:yy hh:mm:ss)
- All international time zones and automatic daylight saving times
- Standard chassis color is black powder coat; other colors available
- Universal worldwide AC power
- Count down or count up capable (using RC500)
- CE marked for sale in EU – FCC, class B, emissions (pending)

SWIVEL BRACKET OPTION AVAILABLE

SPECIFICATIONS

Setup and Control Software

- Configure clocks through USB serial interface
- Configuration utility running under Microsoft Windows Operating Systems XP or better
- World-wide time zone and DST support– no configuration switches
- Up/down timer mode – controlled with RC500 via RS-485 port
- Configuration is saved to non-volatile memory and survives power losses

Standard Rack Mount – 1RU – “Ears” removable

Size:	16.9w x 1.7h x 4.5d	in	**Weight:**	1.0	lb
	43w x 4.31h x 11.5d	cm		0.45	kg

Operating Limitations

- Temperature: 0 to +60°C
- Humidity: Up to 90% (non-condensing)

Connectors

- BNC female – Unbalanced TC input
- Terminal block – 3 position, balanced TC input
- USB connector for setup
- Small IEC connector (320-6)

Power

- Power consumption < 15W
- International 115/230, 50/60 Hz
- Supplied with choice of US, Euro, British or AUS/NZ power cord – others available

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Time Code Driven Clocks 4.3.1

TCD24

TCD24
Masterclock
TIME CODE INPUT
DC IN 12 - 28 VDC
MASTERCLOCK, INC. 2484 W. CLAY ST. ST. CHARLES, MO. 63301 +800-940-2248 MADE IN USA

FEATURES

- 2.3" (*5.8cm*), 4 digit LED – display colors available in **red**, **green**, **amber**, and **blue**
- Syncs to IRIG-B and SMPTE, EBU non-drop frame time codes
- Automatic time code type detection and input level control
- Display time in 12 or 24 hr format – hh:mm
- Display date MM-dd or dd-MM
- Brightness control - 8 levels - switch configurable
- -11.5 to +12 hour, time zone offsets in 30 min increments
- Daylight saving time - US & Canada standard others available on special order
- Standard chassis colors are black or beige (off-white) powder coat

MOUNTING BRACKET

Wall Mount Bracket	

SPECIFICATIONS

Internal Clock

- With loss of time code unit will revert to internal clock until time code is regained and then automatically re-sync to time code when available

Physical

Size: 9.4w x 3h x 4d in
23.9w x 7.6h x 4.1d cm

Weight: 1.4 lbs
0.6 kg

Chassis

- Chassis is non rusting steel with removable back
- Black powder coat painted inside and out
- Configuration switches accessible by removing 4 screws and rear cover

Operating Temperature and Humidity

- Temperature: 0 to +40°C
- Humidity: Up to 90% (non-condensing at +25°C)

Connectors

- Time code input - BNC
- DC input connector is 2.1 mm female DC power plug

Power

- Input voltage 12 – 28 VDC, <5 watt power consumption, external wall mount PS is supplied – please specify 120 or 220 VAC and type of power plug (country)
- Power components have UL, CSA, IEC, EN, VDE & CE approval

IEEE Standard 1344 - Compliant

Reads and displays year and date/time information in IRIG-B control bits.

Masterclock, Inc.

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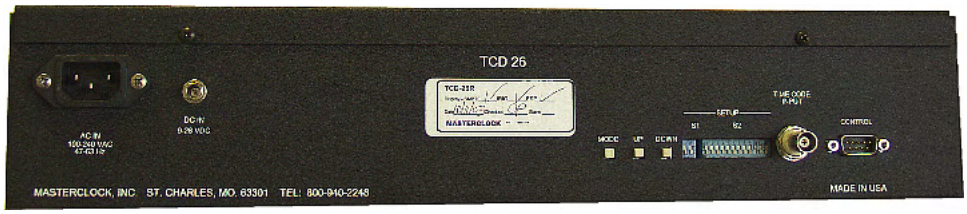
Time Code Driven Clocks 4.3.2

TCD26



FEATURES

- 2.3" (*5.8cm*), 6 digit LED – display colors available in **red**, **green**, **amber**, and **blue**
- Syncs to IRIG-B and SMPTE, EBU non-drop frame time codes
- Automatic time code type detection and input level control
- Display time in 12 or 24 hr format – hh:mm:ss
- Display date MM-dd-yy or dd-MM-yy - switch configurable
- Brightness control - 4 levels - switch configurable
- -11.5 to +12 hour, time zone offsets in 30 min increments
- Daylight saving time - US & Canada standard others available on special order
- All functions controllable via RS-232 port

Rack Mount Clock

SPECIFICATIONS

Internal Clock

- With loss of time code unit will revert to internal clock until time code is regained and then automatically re-sync to time code when available

Counter Mode

- Up/down counter mode – controlled with RC200 or RS232 serial port.

Physical

Size:	19w x 3.5h x 6.25d in 48.3w x 8.9h x 16.5d cm	**Weight:**	8.2 lbs 3.7 kg

Chassis

- Chassis is non rusting steel with removable top
- Black powder coat painted inside and out
- Configuration switches accessible by removing 4 screws and rear cover

Connectors

- Time code input - BNC
- DC input 2.1mm female DC power plug

Power

- Power input - 90 - 264 VAC, 47-63 Hz, universal
- 12 - 28 VDC input can be used as floating backup power supply or as primary power input
- Power consumption < 10W
- Power supply has UL, CSA, IEC, EN, VDE & CE approval

Compliance

- CE Marked - available for sale in EU
- FCC, Class B, Emissions

Operating Temperature and Humidity

- Temperature: 0 to +40°C
- Humidity: Up to 90% (non-condensing at +25°C)

IEEE Standard 1344 - Compliant

Reads and displays year and date/time information in IRIG-B control bits.

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Time Code Driven Clocks 4.3.3

TCDS26

CE

FEATURES

- 2.3" (5.*68cm*), 6 digit LED – display colors available in **red**, **green**, **amber**, and **blue**
- Automatically detects and syncs to IRIG-B or SMPTE, EBU non-drop frame time codes
- Six digit Time display in 12 or 24 hour format – hh:mm:ss
- All international time zones and automatic daylight saving times
- Standard chassis colors are black or beige (off-white) powder coat
- Worldwide AC Power
- Count down or count up time modes
- CE marked for sale in EU – FCC, Class B, Emissions

MOUNTING BRACKETS

Rack Mount Bracket for 19" 2U Rack -or- Wall Mount Bracket (please specify)	
Tilt Wall Bracket Option	

SPECIFICATIONS

Setup and control software

- Configure clocks through USB serial interface
- Configuration utility running under Microsoft Windows Operating Systems
- World-wide time zone and DST support. No configuration switches.
- Command line interface (and drivers) for use with Linux, Unix, MAC
- Up/down timer mode – controlled with RC200/RC500, or USB serial port.
- Configuration is saved to non-volatile memory and survives power losses

Physical

Size: 16.9w x 3.43h x 3.0d in
43w x 8.7h x 7.6d cm

Weight: 4.3 lbs
1.95 kg

Operating Temperature and Humidity

- Temperature: 0 to +60°C
- Humidity: Up to 90% (non-condensing at +25°C)

Connectors

- BNC female – Unbalanced TC input
- Terminal block – 3 position, balanced TC input
- USB connector for setup
- 2.1mm locking DC input jack (DC option)
- IEC connector (AC option)
- RS485 serial for RC200 or RC500 control (option)

Power

- Power consumption < 13W
- AC option - International 115/230, 50/60 Hz
  - Supplied with your choice of US, Euro, British or AUS/NZ power cord – others available
- DC option
  - VDC input can be used as backup power supply or as a primary power input
  - Includes external AC to DC wall-mount power supply with locking DC plug
  - Supplied with your choice of wall transformer (switching power supply) US, Euro, British or AUS/NZ plug – others available

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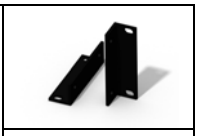
FEATURES

- 1.8" (*4.6cm*), 9 digit LED – display colors available are **red** with **green** and **amber** on special order.
- Automatically detects and syncs to IRIG-B or SMPTE, EBU non-drop frame time codes
- Three digit *Day of Year* display
- Six digit Time display in 12 or 24 hour format – hh:mm:ss
- All international time zones and automatic daylight saving times
- Standard chassis colors are black or beige (off-white) powder coat
- Worldwide AC Power
- Count down or count up time modes
- CE marked for sale in EU – FCC, Class B, Emissions

MOUNTING BRACKETS

Rack Mount Bracket for 19" 2U Rack -or- Wall Mount Bracket Included (please specify)	
Tilt Wall Bracket Option	

SPECIFICATIONS

Setup and control software

- Configure clocks through USB serial interface
- Configuration utility running under Microsoft Windows Operating Systems
- World-wide time zone and DST support. No configuration switches.
- Command line interface (and drivers) for use with Linux, Unix, MAC
- Up/down timer mode – controlled with RC200/RS485 option, or USB serial port.
- Configuration is saved to non-volatile memory and survives power losses

Physical

Size: 17.5w x 3.75h x 3.0d in / 44.5w x 9.6h x 7.6d cm **Weight:** 3.2 lbs / 1.4 kg

Operating Temperature and Humidity

- Temperature: 0 to +40°C
- Humidity: Up to 90% (non-condensing at +25°C)

Connectors

- BNC female – Unbalanced TC input
- Terminal block – 3 position, balanced TC input
- USB connector for setup
- 2.1mm locking DC input jack (DC option)
- IEC connector (AC option)

Power

- Power consumption < 13W
- AC option - International 115/230, 50/60 Hz
  - Supplied with your choice of US, Euro, British or AUS/NZ power cord – others available
- DC option
  - VDC input can be used as floating backup power supply or as a primary power input
  - Includes external AC to DC wall-mount power supply with locking DC plug
  - International AC – 115/230, 50/60 Hz
  - Supplied with your choice of US, Euro, British or AUS/NZ plug – others available

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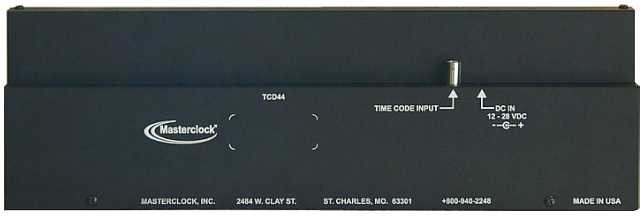
Time Code Driven Clocks 4.4.1

TCD44



FEATURES

- 4" (*10.2cm*), 4 digit LED – display colors available in **red**, **green**, **amber**, and **blue**
- Syncs to IRIG-B and SMPTE, EBU non-drop frame time codes
- Automatic time code type detection and input level control
- Display time in 12 or 24 hr format – hh:mm
- Display date MM-dd or dd-MM
- Brightness control - 8 levels - switch configurable
- -11.5 to +12 hour, time zone offsets in 30 min increments
- Daylight saving time - US & Canada standard others available on special order
- Standard chassis colors are black or beige (off white) powder coat

MOUNTING BRACKET

Wall Mount Bracket	

SPECIFICATIONS

Internal Clock

- With loss of time code unit will revert to internal clock until time code is regained and then automatically re-sync to time code when available

Physical

Size: 16.625w x 5.25h x 1.875d
42.2w x 13.3h x 4.8d cm

Weight: 4 lbs
1.8 kg

Chassis

- Chassis is non rusting steel with removable back
- Black powder coat painted inside and out
- Configuration switches accessible by removing 4 screws and rear cover

Operating Temperature and Humidity

- Temperature: 0 to +40°C
- Humidity: Up to 90% (non-condensing at +25°C)

Connectors

- Time code input - BNC
- DC input connector is 2.1 mm female DC power plug

Power

- Input voltage 12 – 28 VDC, <5 watt power consumption, external wall mount PS is supplied – please specify 120 or 220 VAC and type of power plug (country)
- Power components have UL, CSA, IEC, EN, VDE & CE approval

IEEE Standard 1344 - Compliant

Reads and displays year and date/time information in IRIG-B control bits.

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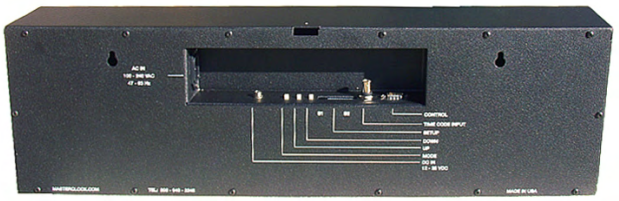
Time Code Driven Clocks 4.4.2

TCD46



FEATURES

- 4" (*10.2cm*), 6 digit LED – display colors available in **red**, **green**, **amber**, and **blue**
- Syncs to IRIG-B and SMPTE, EBU non-drop frame time codes
- Automatic time code type detection and input level control
- Display time in 12 or 24 hr format – hh:mm:ss
- Display date MM-dd-yy or dd-MM-yy - switch configurable
- Brightness control - 4 levels - switch configurable
- -11.5 to +12 hour, time zone offsets in 30 min increments
- Daylight saving time - US & Canada standard; others available on special order
- All functions controllable via RS-232 port

MOUNTING BRACKET

Wall Mount Bracket Option	

SPECIFICATIONS

Internal Clock

- With loss of time code unit will revert to internal clock until time code is regained and then automatically re-sync to time code when available

Counter Mode

- Up/down counter mode – controlled with RC200 or RS232 serial port.

Physical

Size:	25.25w x 7.625h x 4.25d in 64w x 19.4h x 10.8d cm	**Weight:**	9.2 lbs 4 kg

Chassis

- Chassis is non rusting steel with removable top
- Black powder coat painted inside and out
- Configuration switches accessible by removing 4 screws and rear cover

Connectors

- Time code input - BNC
- AC input IEC connector
- DC input 2.1mm female DC power plug

Operating Temperature and Humidity

- Temperature: 0 to +40°C
- Humidity: Up to 90% (non-condensing at +25°C)

Power

- Power input - 90 - 264 VAC, 47-63 Hz, universal
- 12 - 28 VDC input can be used as floating backup power supply or as primary power input
- Power consumption < 10W
- Power supply has UL, CSA, IEC, EN, VDE & CE approval

Compliance

- CE Marked - available for sale in EU
- FCC, Class B, Emissions

IEEE Standard 1344 - Compliant

Reads and displays year and date/time information in IRIG-B control bits.

Masterclock, Inc.

phone (USA and Canada): 1-800-940-2248 | phone (international): +1-636-724-3666
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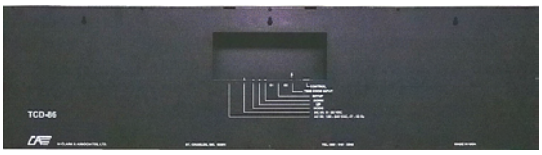
Time Code Driven Clocks 4.5

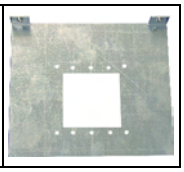
TCD86



FEATURES

- 8" (*20.3cm*), 6 digit LED – display colors available in **red**, **green**, **amber**, and **blue**
- Syncs to IRIG-B and SMPTE, EBU non-drop frame time codes
- Automatic time code type detection and input level control
- Display time in 12 or 24 hr format – hh:mm:ss
- Display date MM-dd-yy or dd-MM-yy - switch configurable
- Brightness control - 4 levels - switch configurable
- -11.5 to +12 hour, time zone offsets in 30 min increments
- Daylight saving time - US & Canada standard others available on special order
- All functions controllable via RS-232 port

MOUNTING BRACKET

Wall Mount Bracket Option	

SPECIFICATIONS

Internal Clock

- With loss of time code unit will revert to internal clock until time code is regained and then automatically re-sync to time code when available

Counter Mode

- Up/down counter mode – controlled with RC200 or RS232 serial port

Physical

Size: 46.75w x 12.25h x 4.5d in
119w x 31h x 11.4d cm

Weight: 26 lbs
11.8 kg

Chassis

- Chassis is welded aluminum with removable back
- Black powder coat painted
- Plexiglas acrylic lens cover
- Note that unit is not waterproof and is designed for office/industrial environments

Operating Temperature and Humidity

- Temperature: 0 to +40°C
- Humidity: Up to 90% (non-condensing at +25°C)

Connectors

- Time code input - BNC
- AC input IEC connector
- DC input 2.1mm female DC power plug

Power

- Power input - 90 - 264 VAC, 47-63 Hz, universal
- 12 - 28 VDC input can be used as floating backup power supply or as primary power input
- Power consumption < 30W
- Power supply has UL, CSA, IEC, EN, VDE & CE approval

IEEE Standard 1344 - Compliant

Reads and displays year and date/time information in IRIG-B control bits.

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Time Code Driven Clocks 4.6.1

CLKTCD12

CE

Standard Faceplate

12/24 Hour Option

True 24 Hour Option

Dual Face Option (see 3.7)

FEATURES

- SMPTE, EBU and IRIG-B (modulated and unmodulated) time code driven
- Self-correcting to non drop frame time code
- -11.5 to +12 hour, time zone offsets in 30 minute increments
- Daylight saving time - US & Canada standard (other countries optional)
- Utilizes microprocessor controlled stepper motor for reliable, accurate, and quiet operation
- Sweep second hand
- Universal AC input voltage & frequency
- Fully Configurable via USB interface with supplied CLKSET software
- Standard chassis colors available are black or beige (off-white) powder coat
- Other colors available with minimum order – contact factory for details

SPECIFICATIONS

Inputs

- Time code input via BNC
- Optional twisted pair to BNC adapter available for time code input - specify BNC-pigtail
- Time zone offset and other setup switches accessible on back panel

Physical

- 12.5” (*31.8cm*) round black metal case with polycarbonate lens/crystal, 4.25” (*10.8cm*) high
- Surface / wall mount bracket provided
- Weight – 7.6 lbs (*3.45kg*)
- Optional true 24hr face available
- Optional 12/24hr face available

Power

- 90-265 VAC 50/60 Hz
- IEC AC power connector and cord
- Specify US, UK, EURO, or AUS/NZ plugs
- DC option also available

Compliance

- CE Marked - available for sale in EU
- FCC, Class B, Emissions

Operating Temperature and Humidity

- Temperature: 0 to +50°C
- Humidity: Up to 90% (non-condensing at +25°C)

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Time Code Driven Clocks 4.6.2

CLKTCD15

FEATURES

- 14.9” (37.85cm) analog clock
- SMPTE, EBU and IRIG-B (modulated and unmodulated) time code driven
- Self-correcting to non drop frame time code
- -11.5 to +12 hour, time zone offsets in 30 minute increments
- Daylight saving time - US & Canada standard (other countries optional)
- Utilizes microprocessor controlled stepper motor for reliable, accurate, and quiet operation
- Sweep second hand
- Universal AC input voltage & frequency
- Fully Configurable via USB interface with supplied CLKSET software
- Standard chassis colors available are black or beige (off-white) powder coat
- Other colors available with minimum order – contact factory for details

SPECIFICATIONS

Inputs

- Time code input via BNC
- Optional twisted pair to BNC adapter available for time code input - specify BNC-pigtail
- Time zone offset and other setup switches accessible on back panel

Physical

- 14.9” (*37.85cm*) round black metal case with polycarbonate lens/crystal, 4.075” (*10.35cm*) high
- Surface / wall mount bracket provided
- Weight – 6.2 lbs (*2.81kg*)
- Optional true 24hr face available
- Optional 12/24hr face available

Power

- 90-265 VAC 50/60 Hz
- IEC AC power connector and cord
- Specify US, UK, EURO, or AUS/NZ plugs
- DC option also available

Compliance

- CE Marked - available for sale in EU
- FCC, Class B, Emissions

Operating Temperature and Humidity

- Temperature: 0 to +50°C
- Humidity: Up to 90% (non-condensing at +25°C)

Masterclock®

Time Code Driven Clocks 4.6.3

CLKTCD18

CE

FEATURES

- 18” (45cm) analog clock
- SMPTE, EBU and IRIG-B (modulated and unmodulated) time code driven
- Self-correcting to non drop frame time code
- -11.5 to +12 hour, time zone offsets in 30 minute increments
- Daylight saving time - US & Canada standard (other countries optional)
- Utilizes microprocessor controlled stepper motor for reliable, accurate, and quiet operation
- Sweep second hand
- Universal AC input voltage & frequency
- Fully Configurable via USB interface with supplied CLKSET software
- Standard chassis colors available are black or beige (off-white) powder coat
- Other colors available with minimum order – contact factory for details

SPECIFICATIONS

Inputs

- Time code input via BNC
- Optional twisted pair to BNC adapter available for time code input - specify BNC-pigtail
- Time zone offset and other setup switches accessible on back panel

Physical

- 18” (*45cm*) round black metal case with polycarbonate lens/crystal, 4.25” (*10.8cm*) high
- Surface / wall mount bracket provided
- Weight – 11.4 lbs (5.*1kg*)
- Optional true 24hr face available
- Optional 12/24hr face available

Power

- 90-265 VAC 50/60 Hz
- IEC AC power connector and cord
- Specify US, UK, EURO, or AUS/NZ plugs
- DC option also available

Compliance

- CE Marked - available for sale in EU
- FCC, Class B, Emissions

Operating Temperature and Humidity

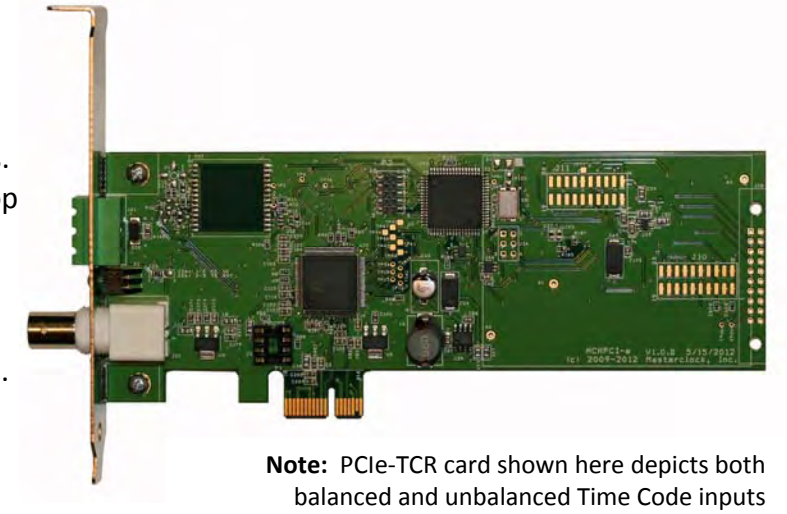
- Temperature: 0 to +50°C
- Humidity: Up to 90% (non-condensing at +25°C)

PCIe with Time Code Reference Input

PCIe-TCR

PCIe-TCR card references Time Code sources. Accepts time code formats: SMPTE (Non-Drop Frame), EBU, NDF and IRIG-B0 and -B1

Increase long-term accuracy and holdover with an **HSO (high stability oscillator)** option.



Note: PCIe-TCR card shown here depicts both balanced and unbalanced Time Code inputs

FEATURES

- Accepts time code formats: SMPTE 24fps (Film), 25fps (EBU), 30fps NDF (Non-Drop Frame) and IRIG-B0 (unmodulated/pulse width modulated) and IRIG-B1 (amplitude modulated, 1kHz)
- Provides millisecond accuracy to applications in Windows environments
- Microsecond accuracy achievable through API development
- Automatic daylight saving time and date
- Software runs under Windows XP, 7 and Server 2003/2008 SP1 version, all in both 32- and 64-bit
- Onboard long-life battery for real time clock retention
- PCIe revision 2.0 – slot compatible X1 through X32
- LED status indicator
- API software development kit and documentation is provided for designers
- Automatic Time Code detection and gain control

SPECIFICATIONS

Physical

- Low profile card and bracket standard
- Length = 6.6" (167.6 mm)
- Height = 2.712" (68.8 mm)
- Full height bracket also available

Certifications

- CE / FCC and RoHS Compliant

Options

- HSO level 1 and 2 upgrades
- PCIe Sync-NTP software provides NTP reference for heterogeneous systems or LAN

Masterclock, Inc.

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PCIe with GPS Reference

Model # PCIe-GPS

The Masterclock **PCIe-GPS card** receives reference time from atomic clocks orbiting in GPS (Global Positioning System) satellites to provide the most accurate time and date information for a Windows PC. See the User Manual for additional GPS information available through API.

Increase long-term accuracy and holdover with a **HSO (high stability oscillator)** option.

FEATURES

- Provides millisecond accuracy to applications in Windows environments
- Microsecond accuracy achievable through API development
- Automatic daylight saving time and date
- Software runs under Windows XP, 7 and Server 2003/2008 SP1 version, all in both 32- and 64-bit
- Onboard long-life battery for real time clock retention
- PCIe revision 2.0 – slot compatible X1 through X32
- LED status indicator
- API software development kit and documentation is provided for designers

SPECIFICATIONS

Physical

- Low profile card and bracket standard
- Length = 6.6" (167.6 mm)
- Height = 2.712" (68.8 mm)
- Full height bracket also available

Certifications

- CE / FCC and RoHS Compliant

Options

- HSO level 1 and 2 upgrades
- PCIe Sync-NTP software provides NTP reference for heterogeneous systems or LAN
- Basic magnetic and standard hard mount antennas
- Antenna cable lengths up to 500’ (150m)

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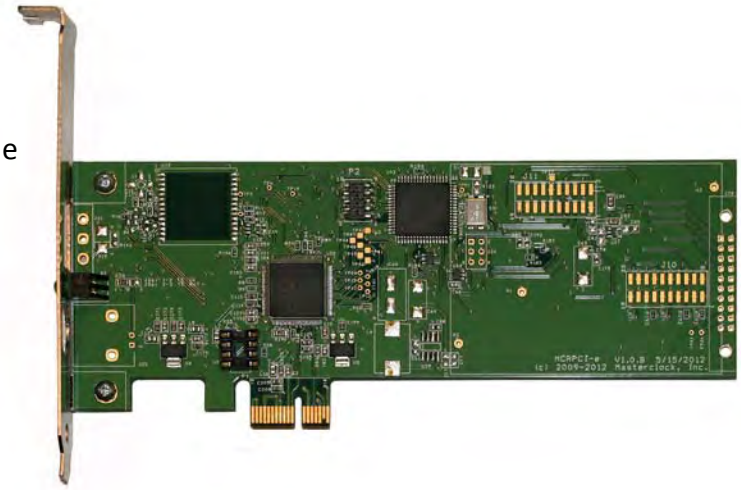
PCIe with Internal Oscillator

PCIe-OSC



PCIe-OSC card provides very stable, accurate time and date information for a Windows PC.

Configuration options include **GPS** or **Time Code** inputs.

Increase long-term accuracy and holdover with an **HSO (high stability oscillator)** option.

FEATURES

- Provides millisecond accuracy to applications in Windows environments
- Microsecond accuracy achievable through API development
- API software development kit and documentation is provided for designers
- Automatic daylight saving time and date
- Software runs under Windows XP, 7 and Server 2003/2008 SP1 version, all in both 32- and 64-bit
- Onboard long-life battery for real time clock retention
- PCIe revision 2.0 – slot compatible X1 through X32
- LED status indicator

SPECIFICATIONS

Physical

- Low profile card and bracket standard
- Length = 6.6" (167.6 mm)
- Height = 2.712" (68.8 mm)
- Full height bracket also available

Certifications

- CE / FCC and RoHS Compliant

Options

- HSO level 1 and 2 upgrades
- PCIe Sync-NTP software provides NTP reference for heterogeneous systems or LAN

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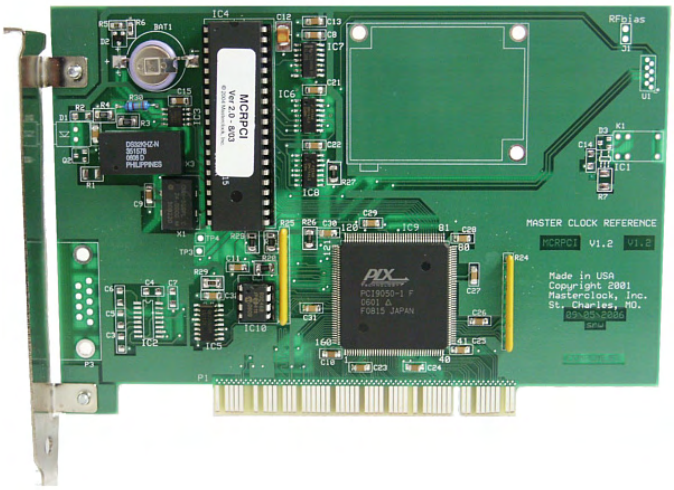


FEATURES

- Accurate clock reference for PCs
- Provide millisecond accuracy to applications and automation systems
- Supplied with software to allow user to set the card and allows the card to set the PC clock
- Ability to update from stable external time source using DLLs & APIs for custom programming; includes sample cource code
- Real Time Clock chip & oscillator with temperature compensation
- Drivers and APIs included for Windows 98/ME/NT/2000 and XP
- Stability of ± 165 ms per day

SPECIFICATIONS

Software Included

- Device driver
- DLL with documented API
- MCRSET utility permits directly viewing, setting, and comparing time
- MCRSYNC service automatically keeps PC clock synchronized

MCRPCI Configuration

- Automatic port and interrupt selection (plug and play compatible)

Operating Temperature

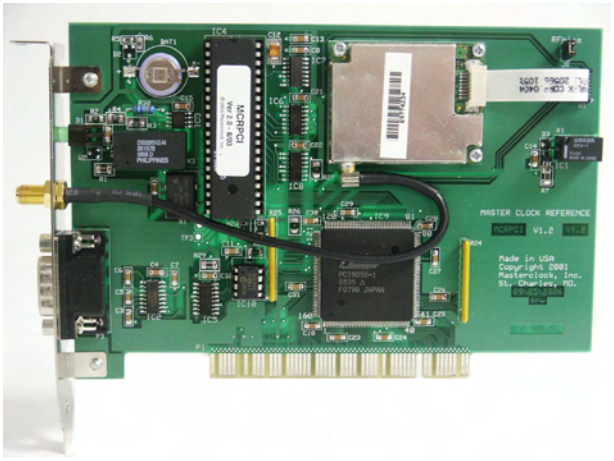
- Temperature: 0 to +60°C

Physical

- ⅓ slot PCI card
- Long life battery on board runs clock when PC is powered off
- Accurate to ±1 Minute/Year at 0°C - 40°C

Data Available

- Time in hours, minutes, seconds, milliseconds with precision time stamp available



FEATURES

- Synchronizes PC to atomic clock in GPS satellites with ± 1µ sec accuracy
- Software is supplied for operation under Windows 98/ME/NT2000 and XP
- APIs provided for custom programming
- High stability oscillator and clock with battery backup
- On board LED indicates GPS lock
- GPS information and PPS timing pulse available via DB9
- Optional software - TCRSync-NTP provides NTP reference for heterogeneous operating systems on an Ethernet LAN, based on GPSPCI.
- GPS information is available internally via the PC bus and externally via the RS-232 port in the NMEA protocol

SPECIFICATIONS

Interrupts

- Automatic interrupt selection

Port Address

- Automatic port selection

Connectors

- DB-9 for RS-232
- SMA (F) for line feed from antenna

Time Reference

- When synchronized the GPSPCI, long-term accuracy is the same as a GPS satellite atomic clock
- If the GPS signal is lost, the unit will revert to the stabilized internal oscillator and maintain accuracy < ±165 ms per day

Physical

- ⅓ slot PCI Card
- Shipped with a full-profile bracket attached

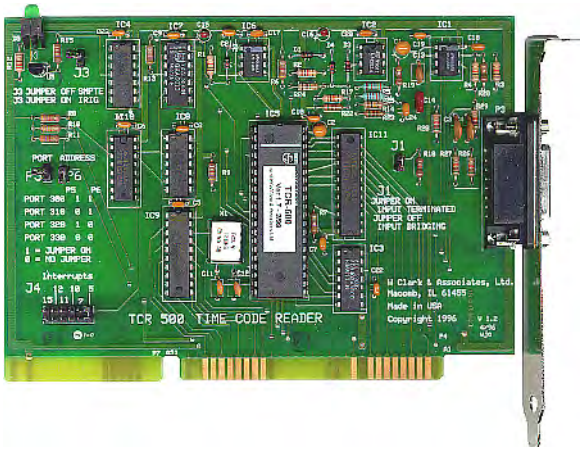
Software Features

- Software runs as a service
- APIs provided with sample source code
- PC clock time is adjusted by tick rate skewing (not jam syncing)

Options

- **Basic** antenna package includes magnetic GPS antenna and 15’ (5m) of cable
- **Standard** antenna package includes marine GPS antenna, antenna mounting kit and 50’ (15m) of cable

TCR500-PCI



TCR500-ISA

FEATURES

- Accepts time code formats: SMPTE 24fps (Film), 25fps (EBU), 30fps NDF (Non Drop Frame) and IRIG-B1 (amplitude modulated, 1kHz)
- Synchronizes PCs - SERVERS - NETS - Automations world wide to millisecond accuracy
- Automatic daylight saving time and date set when using Masterclock's GPS-200A
- TCR500-PCI software includes TCRSync software that runs as a service providing additional diagnostics and other benefits under Windows 95/98/2000/XP and Server 2003
- TCR500-ISA software is supplied for operation under Windows 95/98/2000 and Windows NT (Operation under DOS for ISA model only)
- Optional software – TCRSync-NTP provides NTP reference for heterogeneous operating systems on an Ethernet LAN, based on TCR500 time code input.

SPECIFICATIONS

Interrupts

- PCI model – automatic interrupt
- ISA model - interrupts 5, 6, 10, 11, 12, and 15 (selectable with on-board jumpers)

Port Address

- PCI model – automatic port selection
- ISA model - port address 300h, 310h, 320h and 330h (selectable with on-board jumpers)

Connectors

- PCI version – Isolated BNC for time code input (Balanced input)
- ISA version – DB-15 (F) for balanced time code input (DB-15 to BNC supplied with the card)

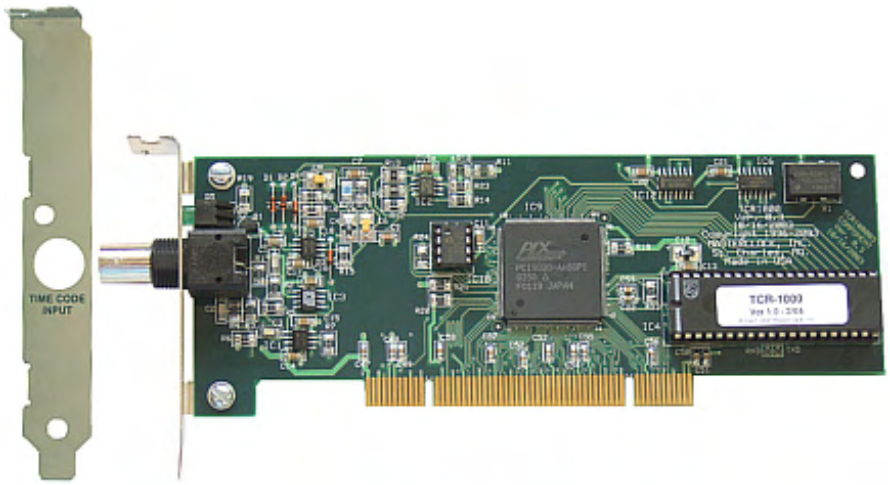
Physical

- The TCR500 is a ⅓ slot PC-AT card
- Shipped with a full-profile bracket attached

Other features

- Set PC clock +12 to -11.5 hour offset
- Automatic daylight saving time option
- Automatic date set with GPS-200A generator
- Universal 3.3V or 5.0V bus
- Battery backed RTC (Real Time Clock)

Note:
All ISA products are available as special order.



FEATURES

- Accepts time code formats: SMPTE 24fps (Film), 25fps (EBU), 30fps NDF (Non Drop Frame) and IRIG-B0 (unmodulated/pulse width modulated) and IRIG-B1 (amplitude modulated, 1kHz)
- Allows millisecond synchronization accuracy
- Automatic daylight saving time and date
- TCRSync1000 software that runs as a service providing additional diagnostics and other benefits under Windows XP/7/Server 2003 and 2008
- Optional software – TCRSync-NTP provides NTP reference for heterogeneous operating systems on an Ethernet LAN
- API software development kit and documentation is provided for designers

SPECIFICATIONS

Connector

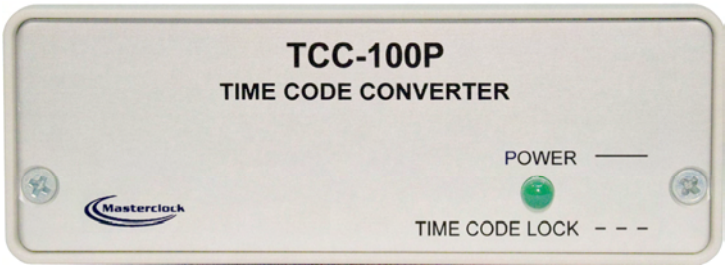
- BNC connector for time code input
- Optional three pin positive locking, right angle pin header (0.1" pin spacing) for time code input

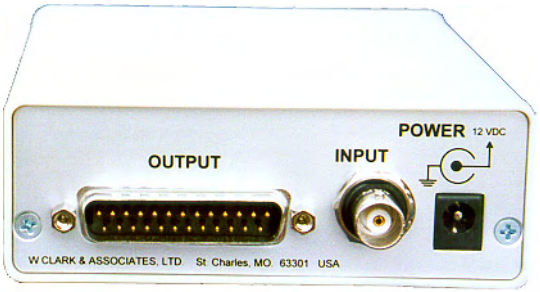
Physical

- ½ height card
- Length = 6.6" (167.6 mm)
- Height = 2.5" (63.6 mm)

Other features

- LED status indicator
- Universal 32-bit/33 MHz or 64-bit bus
- 3.3V and 5V universal card
- Operates in higher speed and wider buses
- Detects time code type - automatic
- Time code level set - automatic
- Software runs as a service under Windows XP/7/Server2003 and 2008





FEATURES

- **CONVERTS time codes TO PARALLEL BCD**
- Reads - smpte - (Including - EBU, film & drop frame) – IRIG-B
- Outputs parallel BCD time information
- Output format is directly compatible with ***Utah Scientific mc-500 series switchers***
- 120/240 VAC with supplied external wall mounted power supply or 12 VDC operation. Power supplies available for most countries

Rack mountable with an **RM4**

SPECIFICATIONS

I/O Connections

- Input power is 12 VDC via - 2mm female power connector
- Supplied with wall mount 12 VDC Power Supply
- Time code input - BNC socket
- BCD output - db-25

Operating Temperature

- Temperature: 0 to +70°C

Physical

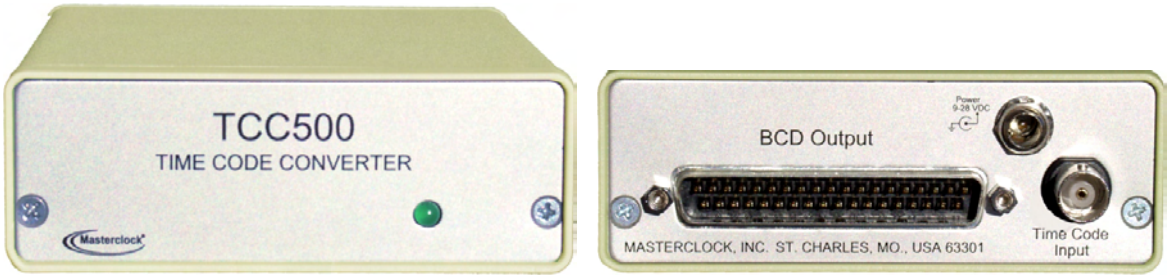
Size: 4.2 x 1.5 x 5.5 in / 10.6 x 3.8 x 14 cm **Weight:** 16 oz / 435 g

Case

- Cover - off-white aluminum
- Front/rear panel - clear anodized aluminum

Rack Mount

- Optional rack mount kit is available - RM4



FEATURES

- Reads - SMPTE (including EBU, film & drop frame) and IRIG-B
- Outputs parallel BCD time with 8 digit or one millisecond resolution - hh:mm:ss:ms-(frames)
- 120/240 VAC with supplied external wall mounted power supply or 12-28 VDC operation. Power supplies available for most countries throughout the world

Rack mountable with an **RM4**

SPECIFICATIONS

I/O Connections

- Input power is 12 VDC via 2mm
- Female power connector
- Time Code input - BNC socket
- BCD output - DB-37

Operating Temperature

- Temperature: 0 to +70°C

Physical

Size: 5.5 x 4.13 x 1.5 in / 14 x 10.48 x 3.81 cm

Weight: 16 oz / 435 g

Case

- Cover - off-white aluminum
- Front/rear panel - clear anodized aluminum
- Optional rack mount kit is available - RM4

FEATURES

- **Reads SMPTE / EBU time**
- -11 to +12 hour selectable time zone offsets
- Automatic daylight saving time adjustment (selectable)
- Time and date information via RS-232 or RS-422
- Time mark pulse output (ttl level) at 1 per: sec, min, hour or day
- Dry contact closure at 1 per: min, hour or day
- Contact and pulse output can be advanced by 1 second for system re-sync at 59 sec point
- Heathkit WWV clock output emulation (for GV switchers)
- Output time code as specified with above options

Rack mountable with an **RM4**

SPECIFICATIONS

I/O Connections

- Time code input - BNC socket
- RS-232, pulse, contact closure and time code output - DB-9 male
- Optional DB-9 to BNC adapter BNC-9
- Input power is 12 VDC via - 2mm female power connector
- Supplied with wall mount 12 VDC Power Supply

Operating Temperature

- Temperature: 0 to +70°C

Physical

Size:	4.2 x 1.5 x 5.5 in 10.6 x 3.8 x 14 cm	**Weight:**	16 oz 435 g

Case

- Cover - off-white aluminum
- Front/rear panel - clear anodized aluminum

Rack Mount

- Optional rack mount kit is available - RM4

FEATURES

- **Generates signals for NENA/PSAP equipment**
- Operate from IRIG-B or SMPTE time code inputs
- IRIG-B modulated or pulse-width encoded time code output
- IRIG-E modulated or pulse-width encoded time code output
- All time code outputs support signature control
- All time code outputs encode NENA extensions
- Supports NENA-defined ASCII outputs at 9600, 4800, 2400, and 1200 baud
- Perform time zone adjustments in display, serial, and time code outputs
- Perform daylight savings time adjustment in display, serial, and time code outputs
- Provides dry contact closure alarm for time code or power loss

Rack mountable with an **RM4**

SPECIFICATIONS

I/O Connections

- Input power is 12 - 28 VDC via - 2mm male power connector
- Time code input - BNC socket
- RS-232, pulse, contact closure and time code output - DB-9 male
- optional DB-9 to BNC adapter BNC-9

Operating Temperature

- Temperature: 0 to +60°C

Physical

Size: 4.2 x 1.5 x 5.5 in
10.6 x 3.8 x 14 cm

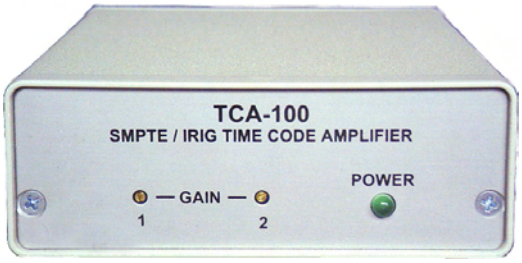
Weight: 16 oz
435 g

Case

- Cover - off-white aluminum
- Front/rear panel - clear anodized aluminum

Rack Mount

- Optional rack mount kit is available - RM4



FEATURES

- Designed to amplify and isolate time code signals for distribution to multiple feeds over large areas & distances
- Works with IRIG (all except differential), SMPTE, EBU & others
- Transformer outputs for superior isolation
- BNC I/O connectors for ease of connection
- Balanced I/O available via DB-9 connector
- Two separate - isolated output channels available

Rack mountable with an **RM4**

SPECIFICATIONS

Output Level

- Up to 14 V PP - (with 600 ohm load)
  Each channel is individually adjustable with a front panel accessible level control

Output Options

- Each output channel can be jumpered to provide: isolated balanced to ground, single ended grounded or transformer isolated differential

Input Level

- 2 – 14 Vpp - range of input for rated output

Frequency Response

- 100 Hz to 8 kHz ± 1dB

Rack Mount

- Optional rack mount kit is available - RM4

Physical

Size:	4.2w, 1.5h, 5.5d in 10.6w, 3.8h, 14d cm	**Weight:**	16 oz 435 g

Case

- Cover - off-white aluminum
- Front/rear panel - clear anodized aluminum

I/O Connectors

- Input is balanced and connected via an isolated BNC or 2 pins of a DB-9 male connector
- Outputs are transformer isolated, balanced and available via isolated BNCs or separate pins of a DB-9 male connector
- Power connector is 2 mm male plug

Power Supply

- Input voltage 12 – 28 VDC, <1 watt power consumption, external wall mount PS is supplied – please specify 120 or 220 VAC

Operating Temperature

- Temperature: 0 to +70°C

Time Code, RF & Pulse Amplifier

DA12

DA12 SPECS

- 2 inputs: 1/12 or 2/6 input/output
- Output banks are selectable AC or DC coupled
- Dual isolated output banks
- Standard chassis color is black powder coat
- Universal worldwide AC power
- CE marked for sale in EU –FCC, class B, emissions (pending)
- Green power LED on front panel

INPUTS - 2

- RF

Frequency	0 Hz – 20 MHz
Level	1 V rms [15 dBm max]
Impedance	50 Ω or 600 Ω
Isolation A to B	>85 dB

- Pulse /DC IRIG Time Code

Frequency	1PPS to 10 MPPS
Level	0-7V p-p
Duty Cycle	0 to 100%
Impedance	50 Ω or 600 Ω

- AM IRIG Time Code

Frequency	1 PPS to 10 MPPS
Level	0-6 V p-p
Modulation Frequency	Up to 1 MHz
Code Format	Any IRIG format, IEEE 1344, NASA 36, 2137, XR3
Impedance	50 Ω or 600 Ω

OUTPUTS - 12

- RF

Frequency	0 Hz – 20 MHz
Level	1 V rms [15 dBm max]
Gain	0 dB to 12 dB trimable
Harmonic	<-40 dBc
Non-harmonic	<-80 dBc
Load Impedance	50 Ω

- Pulse /DC IRIG Time Code

Frequency	1PPS to 10 MPPS
Duty Cycle	0 to 100%
Rise Time	< 20 ns
Fall Time	< 20 ns
Skew	< +2 ns
Load Impedance	50 Ω

- AM IRIG Time Code

Frequency	1 PPS to 10 MPPS
Modulation Frequency	Up to 1 MHz
Code Format	Any IRIG format, IEEE 1344, NASA 36, 2137, XR3
Load Impedance	50 Ω

Standard Rack Mount – 1RU – "Ears" removable

Size:	16.9w x 1.7h x 4.5d	in	**Weight:**	1.0	lb
	43w x 4.31h x 11.5d	cm		0.45	kg

Operating Parameters:
Temperature: 0 to +50°C (0 to +40°C, ±1 min/year for standard TCXO)
Humidity: Up to 90% (non-condensing at +25°C).

Masterclock, Inc.
phone (USA and Canada): 1-800-940-2248 | phone (international): +1-636-724-3666
email: sales@masterclock.com | online: www.masterclock.com
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Time Code Interface

Model # TCS 100

The **TCS100** is an automatic time code changeover unit designed to provide automatic or manual switching between two time code sources.

Rack mountable with **RM4**

FEATURES

- Accepts SMPTE / EBU or IRIG-B (modulated and unmodulated TC)
- Automatically determines TC type and switches to the alternate source if TC is lost or if a problem is detected in the primary TC source.
- Decodes both sources of incoming TC, compares availabity and quality of both sources to a third internal standard maintained within the changeover unit and makes logical decisions concerning TC status for the purpose of automatic switchover.
- Front panel switches allow manual selection of source A or B or automatic mode.
- "Good" / "Fail" indication and selection status of each TC source and the changeover unit is shown with front panel LEDs.
- An auxiliary A/B source can be switched along with the TC. This auxiliary switching is a relay contact and can be used to switch any low level control or signal source.
- Internal alarms sound (can be disabled with jumpers) upon loss or failure of a source of TC or switcher unit. A relay contact closure is provided for an external alarm. Alarm can be reset from front panel.
- Status and other system information is provided via a simplex (one way) RS-232, 9600 BAUD

CONNECTORS

- TC inputs: isolated BNC - balanced
- TC output: isolated BNC - balanced
- Balanced input & output connections via DB-9
- Auxilary switching via DB-9
- External alarm via DB-9
- Input power is 12 - 28 VDC

PHYSICAL

- Size: 4.2 x 1.5 x 5.5 inches – (10.6 x 3.8 x 14 cm)
- Weight: 16 oz – (454 g approx. w/o ps)
- Power supply (approximate) 12 oz - 340g
- Cover - eggshell white aluminum
- Front/rear panel - burnished aluminum

POWER

- 12 - 28 VDC external wall mount supplied via 2mm male power connector, UL & CE listed
- 115/230, 50/60 Hz
- Power consumption 6 watts
- Supplied with US, Euro-plug, British or AUS/NZ - Others optionally available

OPERATING PARAMETERS

- Temperature: 0 to +60°C
- Humidity: Up to 90%, non-condensing

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Bell Ringing System

CRL 1000

FEATURES

- Four circuit programmable bell controller synchronized to network time (NTP)
- Industrial or institutional bell ringer system
- Reference external NTP source or use internal clock with accuracy of ±1 minute per year
- Executes up to 256 schedule events per day
- Circuits may be scheduled independently
- Schedule in 12- or 24-hour format
- Front panel displays time or date of internal clock and LED indication of relay activation
- Provides 24VAC, 16 Amps (400VA) with current limited outputs at 4 amps each circuit
- Drives up to 20, 24VAC bells per circuit (80 total bells at 200mA each)
- Master input terminal allows all bells to be rung with external switch closure - usable for master alarms such as fire or general evacuation

Optional Bells

6 in (150mm) 24VAC, .170A, 91 dB @ 10' (*3m*) typical

10 in (250mm) 24VAC, .170A, 94 dB @ 10' (*3m*) typical

SPECIFICATIONS

Configuration and Scheduling Software

- Supports DHCP/BOOTP for automatic acquisition of network address, nameservers, and time server configuration
- NTP synchronization options, and more
- Provides dynamic configuration for networking parameters, time zone/daylight savings time
- Configure clocks through provided Windows network discovery software or TELNET
- Configuration is saved to non-volatile memory and survives power losses
- Encrypted network messages prevent unauthorized tampering of configuration

Physical

Size:	19w x 3.5h x 9.25d in 48.3w x 8.9h x 23.5d cm	**Weight:**	19.5 lbs 8.6 kg

Connectors:

- Ethernet - RJ45
- AC input - IEC connector
- Terminal Block, 24 VAC wiring to bells
- 4 each individual switch circuit breakers - 1 for each bell circuit

Chassis

- Rack mounted welded steel chassis with removable rack ears
- Black or off-white powder coat paint

Power

- Power input 120/240 VAC, 50/60 Hz
- Includes AC input power cord

Operating Temperature

- Temperature: 0 to +70°C

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FEATURES

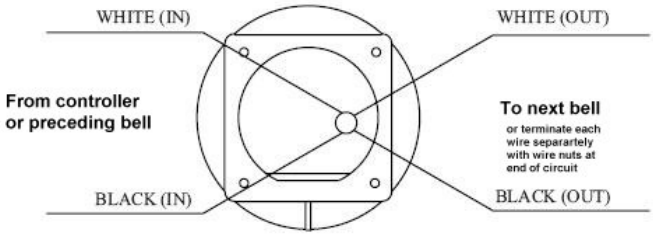
- **6" (*150mm*) and 10" (*250mm*) models available**
- Vibrating type bell for general purpose signaling
- Low power consumption and high decibel rating
- Use with Masterclock CRL1000 Bell Ringer Controller
- Mounts on standard 4" square (101mm) electrical box
- Indoor or outdoor use, -40° to 150°F (-40° to 66°C)
  (NOTE: outdoor use requires weatherproof mounting electrical box)
- UL Listed
- 4 wire termination – 18 AWG stranded
- Red powdercoat finish

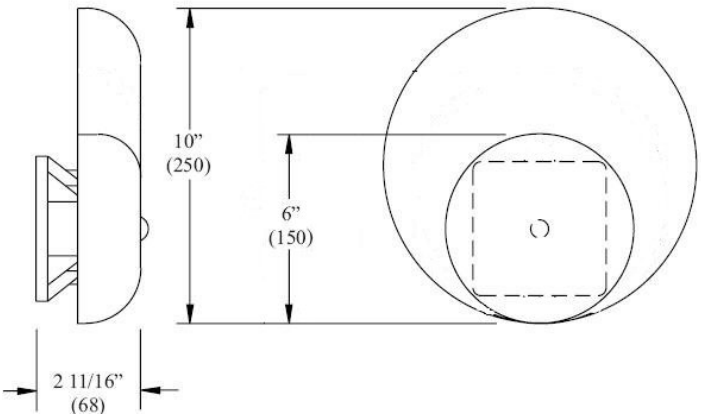
Model	Size Inches (mm)	Input Voltage	Input Current (Amps Max)	Typical dB @ 10' (3m)	Minimum dB @ 10' (3m)
Bl24-6	6 (150)	24 VAC	0.170	91	78
Bl24-10	10 (250)	24 VAC	0.170	94	78

Installation

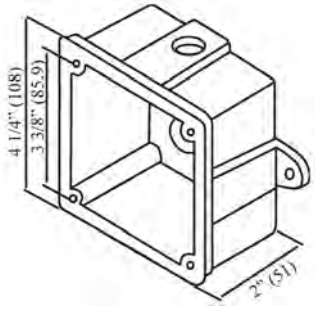
1. Remove the gong
2. Connect wiring (see diagram)
3. Mount bell mechanism to mounting box with striker pointing down.
4. Reinstall the gong, ensuring that the positioning pin is in the hole of the gong.
5. Test for proper operation

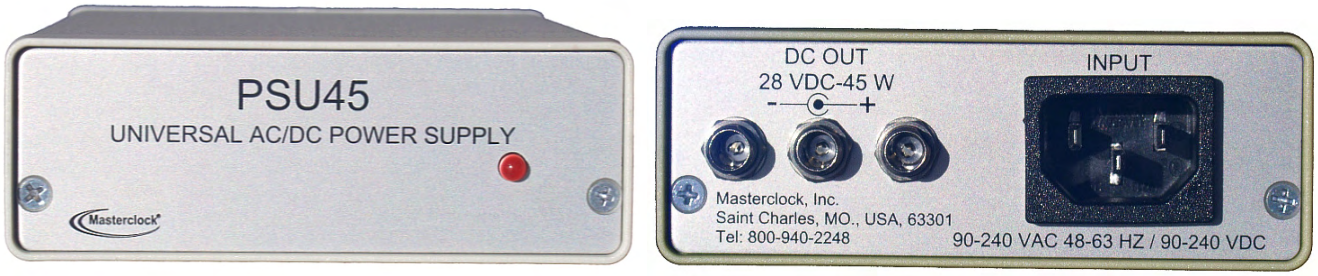
(NOTE: failure to install with striker down will prevent the bell from operating)


WHITE (IN)
WHITE (OUT)
From controller or preceding bell
To next bell
or terminate each wire separartely with wire nuts at end of circuit
BLACK (IN)
BLACK (OUT)



Optional Weatherproof Backbox





Combines power needs for an orderly installation of Masterclock equipment. Mounts in RM4 rack mount to supply 28V power for up to 9 Masterclock rack mounted devices.

FEATURES

Rack mountable with an **RM4**

- Universal rack mounted power supply
- outputs 28 VDC
- Inputs 90-240 VAC/47-63 Hz or 90-240 DC
- 45 watt capacity
- IEC input connector
- 3 each DC power plugs (power capacity supports up to 9 Masterclock devices)

SPECIFICATIONS

Outputs

- 3 DC jacks, 28 VDC

Connectors

- IEC power cord
- Power plugs - 3 each DC male power jacks Switchcraft L722A, 2.1mm jack

Physical

Size:	16.625w x 5.25h x 1.875d 42.2w x 13.3h x 4.8d cm	**Weight:**	4 lbs 1.8 kg

Operating Temperature and Humidity

- Temperature: -20 to +70°C
- Humidity: Up to 90% (non-condensing at +25°C)

Case

- Cover - off-white aluminum
- Front/rear panel - clear anodized aluminum

Power Supply

- IEC power cord available in US, EURO, UK, and AUS/NZ - Please specify

Rack Mount

- Optional rack mount kit is available - RM4

Allows power to be transferred over unused pairs of CAT5/6 Ethernet cable. Saves on installation cost of wiring power to PoE compliant Ethernet devices.

FEATURES

- Compliant with IEEE802.3af PoE standard
- Data and Power carried over Ethernet cable
- Works with Masterclock and other PoE compliant clocks and devices
- Non-Vented Case
- Diagnostic LEDs
- Universal worldwide AC input
- IEC input power connector
- Supplied with choice of US or various international power cords
- Single Port

SPECIFICATIONS

Output Voltage
- 48 V, 0.35 A ± 4%

Maximum Output Power
- 15.4 W

AC Input Voltage
- 90 - 264 VAC, 47 to 63 Hz

Physical

Size: 2.55w x 1.42h x 5.51d in
6.5w x 3.6h x 14d cm

Connectors
- IEC power connector
- Ethernet interface - RJ45

Power Cord
- IEC power cord available in US, EURO, UK, and AUS/NZ - please specify

Agency Approvals
- UL, TUV, CE, FCC

Cisco SF302-08MP – 8 port PoE switch

- Standards-based IEEE 802.3af Power over Ethernet (PoE) - Up to 8 ports at 15.4W
- Dual Gigabit uplinks provide increased bandwidth and redundancy
- 802.1x Port Authentication and MAC address filtering brings network security down to the switch port level
- Advanced QoS (Quality of Service) enables the network to be optimized for your networked applications, including voice, video and data storage

Cisco SF300-24P – 24 port PoE switch

- Standards-based IEEE 802.3af Power over Ethernet (PoE) - Up to 12 ports at 15.4W for 180W of total PoE power
- Secure management via SSL and secure user access via 802.1x Port Authentication and MAC address filtering
- IGMP snooping, L2/L3 CoS, queuing and scheduling ideal for voice and video
- Intelligent traffic management with Rate Limiting, Policing ACLs, and Storm Control

Cisco SF300-48P – 48 port PoE switch

- Optimized to be your network core with (48) 10/100 Ethernet ports, (2) shared Gigabit combo ports and 2 Gigabit uplink ports
- Standards-based IEEE 802.3af Power over Ethernet (PoE) - Up to 24 ports at 15.4W for 375W of total PoE power
- Solution ideal for voice and video with IGMP snooping, L2/L3 policy filters
- Secure management via SSH/SSL and secure user access via 802.1x Port Authentication and MAC address filtering

Standard GPS Antenna

The standard antenna, coaxial cable and antenna mounting hardware come standard with GPS-referenced Masterclock equipment packages. The GPS-based product includes the antenna, coaxial cable with connectors, and antenna mounting. This antenna can be mounted either indoor or outdoor so long as it is exposed to the sky. The antenna was initially designed for external mounting in marine environments. It is moisture proof against most normal atmospheric conditions. If indoor it should be mounted in or close to a window.

Optional Cable Packages

PKG1	75'/23m - ¼"/.6cm coax - SMA-M connectors
PKG2	100'/30m - ½" 1.3cm coax - SMA-M connectors
PKG3	150'/45m - ½" 1.3cm coax - SMA-M connectors
PKG4	200'/61m - ½" 1.3cm coax - SMA-M connectors
PKG5	250'/76m - ½"1.3cm coax - SMA-M connectors
PKG6	300'/91m - ½"1.3cm coax - SMA-M connectors
PKG7	350'/106m - ½"1.3cm coax - SMA-M connectors
PKG8	400'/122m - ½"1.3cm coax - SMA-M connectors
PKG9	450'/137m - ½"1.3cm coax - SMA-M connectors
PKG10	500'/152m - ½"1.3cm coax - SMA-M connectors
Per foot	50'/15m to 500'/150m, ½"/ 1.3 cm diameter coaxial cable - available on a per ft./M basis. Check with factory for details and pricing.
Antenna Pigtail	18"/46cm long - .25"/1.3 cm diameter coaxial cable with SMA to SMA installed.

Basic GPS Antenna

Also available is the Basic GPS Antenna. It is a simple, magnet mounting GPS antenna with 16' (*5m*) of coax cable. This antenna can be mounted either indoor or outdoor so long as it is exposed to the sky.

Standard Antenna
Pre-amplified, gain - 32dB
Voltage: 3.5-5 VDC - 27 mA(max)
Connector: SMA Female
Dimensions: 3.7dia x 5.5h in
9.3dia x 14h cm
Weight: 6.7 oz (*190 g*)
Environment: -40° to +85°C with high humidity

50' (15m) coaxial cable

Cable: Belden 8219 or equivalent
Diameter: 0.2" (*5mm*)
Connectors: SMA - SMA
Length: 50' (*15m*)
Weight: 1.25 lbs (*.6kg*)
Note that cable is very low loss and that regular RG58 cable will not work.

Antenna Mounting

¾" (*1.9cm*) PVC threaded pipe
2 each pipe clamps

All Masterclock® GPS receiving devices use either a TNC or SMA connector (jack) for connecting to an external antenna. When 1/2" cable is used and is routed to the receiving device, because of the weight and size of the cable, there could be undesirable mechanical tension or force applied to the receiver connector. This would be particularly true in restricted areas where an adequate bending radius is not possible for the cable. In such cases it is recommended that a "pigtail" section of coaxial cable be used to connect from the larger cable to the receiving connector. These pigtail sections are fabricated using Beldin 8219 cable and are shipped with appropriate connectors installed.

SA90-SMA
Surge Arrestor
(supplied with surge arrestor and
SMA female to SMA male cable)

Broadband Surge Arrestor *for DC-3000 MHz applications*

Help protect your equipment from the effects of lightning induced surges with the broadband SA90-SMA Surge Arrestor. This DC-passing surge arrestor operates with frequencies up to 3 GHz and helps with protection from lightning strikes. The arrestor is compatible with the IEEE 802.11b standard.

FEATURES

- Easy installation for Masterclock GPS antenna systems- compact design fits in cramped installations
- Weather resistant in mated condition
- Quality protection at a competitive price
- Good return loss characteristics
- Low throughput energy during lightning strikes
- Contains 1 each surge arrestor with SMA female and SMA male connectors and a18” – 45 cm low loss coaxial pigtail (SMA female to SMA male) - everything needed to install the surge arrestor either outside adjacent to the antenna or inside at the receiving hardware.*
- For maximum protection 2 units can be installed - see rear of sheet for details.

SPECIFICATIONS

Connectors: SMA-Female – SMA Male
Pass Band: DC – 3GHz
Max power handling: 200 W
Impedance: 50 Ω
Insertion loss, dB (MHz): Less than 0.2 dB (1000–3000)
VSWR: less than 1.5:1 2.7 GHz, 1.65:1 3 GHz
DC discharge voltage: 90 VDC
Impulse discharge current: 5 KA 8/20 µ max withstanding current
Outer conductor finish: nickel plated
Hardware provided: Grounding screw, washers and terminal lug
Operating temperature: C -40° to +85°

SURGE ARRESTOR INSTALLATION

WARNING

Ensure that the antenna and coaxial cable that the surge arrestor is protecting is not exposed to direct lightning strikes. This device offers no protection for such strikes and will be destroyed – along with whatever equipment that it is connected to - by a direct strike.

Notice:

The installation, maintenance, or removal of antenna and surge arrestor systems requires qualified, experienced personnel. These installation recommendations are written for such personnel. Installations of this type of energy suppression equipment should be made in accordance with local safety and electrical codes and with regard to good electrical and engineering practices. If you have questions regarding the use of this type of product with respect to your installation, contact a local licensed electrical contractor for the latest electrical codes and guidelines. In no event shall Masterclock, Inc. be liable for any direct, indirect, special, incidental, or consequential damages caused from the installation or use of this product.

Installation:

For maximum protection install two surge arrestors, one outside, either close to the antenna or at the point where the coaxial cable enters the building and a second as close to the receiving equipment. A good rule of thumb to remember is that all lines entering or exiting a building need protection.

The SA90 is a bidirectional RF device. Either RF port may be connected to the equipment side or the antenna side of the transmission line interface to provide protection. Do not leave the RF ports exposed when installed outdoors.

The surge arrestor must be grounded by attaching a ground wire to the grounding lug. This wire must be attached to a master ground bar or the systems earth grounding to ensure a low impedance path to ground. During installation, all grounding contact surfaces must be clean, dry, and free of oxidation.

Grounding Recommendations:

A protection system with a poor ground is the same as having no protection at all.

Recommended grounds are the utility company ground, a ground rod, well casings, and cold water pipes that are of continuous metal. A note of caution, sometimes the metal-cold water pipes are repaired and/or extended PVC piping. The introduction of PVC material renders the cold water pipe ground unacceptable. A thorough investigation of a cold water pipe ground is important since the PVC repairs or extensions may be covered by drywall. Grounds that are unacceptable include sprinkler pipes, PVC pipe, conduit, buried wire and any ground that cannot be verified.

Bonding ensures the most effective ground. Bonding ties all of the grounds in the building together electrically. If there is a rise in ground potential and all of the grounds are bonded, no damage will occur since it is differential voltage that causes problems.

It is absolutely necessary to make sure that the ground used for the AC power is the same as the ground used for the data-line surge protectors. A common ground reference must be achieved for all equipment.

All ground wires must be as short as possible and it is **imperative** that the ground wire not be coiled nor looped – it must be as straight as possible. Regarding the diameter of the ground wire, the **larger the better**.

Finally, the earth ground resistance on which the whole grounding system relies, must be less than 5 ohms between any two points within the ground system.

Rack Mount Bracket

RM4

Anodized Aluminum Rack Mount Kit provides a sleek, compact, rack ready housing for up to four of our devices.

RM4 FEATURES

- Houses up to 4 Masterclock units
- Blank panels are supplied for any unused spaces
- Components can be easily installed or removed in the field

SUPPORTED DEVICES

- GPS200
- MCR1000
- NTP100
- TCA100
- TCC100
- TCC500
- TCD200
- TCI232
- TCI500
- TCINENA
- TCO100
- TCS100

SIZE

- Standard 1RU. 19” x 1 ¾” (*48.25 cm x 4.45 cm*)
- Weight 6oz (*170 g*)

Masterclock, Inc.

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Masterclock's predecessor company - Clark and Associates - was founded by William (Bill) Clark in 1986 to build automation systems for the Radio & TV industries. Masterclock itself was incorporated as an entity in 1994. Starting with a two person operation in the proverbial home garage it has grown into a successful enterprise doing multi-million dollars in business throughout the world.

The company's first product was the TCR100 time code reader card developed in 1986 to synchronize IBM personal computers in Radio & TV broadcast networks automation systems. Over the years Masterclock has introduced an array of products to meet the demand of customers engaged in many different types of activities where correct and accurate time is critical; they are among the world's most demanding and time sensitive users. These products now include digital and analog clocks, time and frequency standards, devices to synchronize computers, networks and many other systems where accurate time is required.

Open Standards

We adhere to open worldwide standards such as Network Time Protocol (NTP), PoE standard IEEE 802.3af, and IRIG / SMPTE / EBU time codes for the distribution of time and date information. Many other companies use closed distribution standards thus locking the end user into proprietary hardware and systems.

Made in USA

In order to maintain and control quality all of our products are engineered, designed and built in St Charles (suburban St Louis), Missouri, USA.

Markets Served

Network / computer synchronization and time, power and utilities, Broadcasting and communications, Government and Military, Commercial / Industrial Public Safety / 911 dispatch centers

Customers

Many of our customers are engaged in world wide operations where correct and reliable time is critical. Some of our major customers (some of who have purchased thousands of our clocks) include: Microsoft, PBS, Daimler Chrysler, Time Warner, ABC, IBM, Lockheed Martin, Hughes, CBS, General Electric, Raytheon, NBC General Motors and Boeing.

Product Value

Masterclock has established a reputation for reliability and good product value. All products are carefully and conservatively designed for many years of use. Our products and systems are modularized and "unbundled" allowing customers to buy just those parts or components that are needed.

NTP

Network Time Protocol (NTP) is an open standard Internet protocol that utilizes standard Ethernet wiring to synchronize computers, clocks, networks and other systems to an NTP reference server. The signal can be transmitted over LAN and WAN wired networks and over various wireless systems.

There are numerous public sources of NTP available. Many universities and governmental agencies provide access to NTP servers although, because of the number of request, some of these facilities are limiting access and in some cases even charging access fees.

NTP service can be established on your internal network using a stand alone device such as the NTP100 which gets time from the atomic clocks in the GPS system and generates NTP. GPS receiver cards such as the GPSPCI along with NTP software in a computer on the network can also provide a local NTP reference source. In many cases because of firewalls and other network constraints a local NTP server is the recommended approach and in many cases provides a more accurate and available NTP.

Accuracy of time in a typical NTP installation will depend on many factors but is typically better than ± 500 milliseconds.

Time Code

Time code is a low power audio signal similar to the signal of a modem that contains time and date information. This signal can be transmitted over inexpensive coaxial cable and wiring such as telephone pairs. It can be distributed much as audio wires can be connected in parallel to multiple speakers. With the proper distribution amplifiers, such as the TCA100, it can be sent over long distances and connected in parallel to hundreds of clocks and other devices. It is generally an inexpensive, robust and reliable means of distributing time and date around a local plant or operation.

With an accurate time code source such as the GPS200 and a time code reader card such as the TCR500 a local system can be synchronized to within 20 or 30 milliseconds limited by the software operating system.

Power-over-Ethernet (PoE) extends the versatility for system designers and companies. No longer will one have to locate access points within the typical six foot electrical cord reach of an AC outlet or look for convenient locations to install new outlets at points where its suitable to run conduit and mount outlet boxes.
PoE only requires technicians to run one Ethernet cable – CAT5 or CAT6- to the access point for supplying both power and data. With PoE, Power-sourcing equipment detects the presence of an appropriate "power device" (e.g. PoE Hub) and injects applicable current into the data cable. An access point can operate solely from the power it receives through the data cable. The PoE is known by IEEE802.3af international standard.

PoE offers the following benefits:
Cost Savings – It significantly reduces the need for electricians to install conduit, electrical wiring and outlets throughout a facility. Consider an installation of 50 or more access points. This requires lots of conduits, outlet boxes, electrical wiring and the time of qualified electrician(s). The low cost of deploying PoE compared to traditional electrical circuits leads to worthwhile returns on investment.

Flexible Access Point Locations – With PoE a LAN designer has greater freedom to locate access points. You don't need to depend on only locations within short distances from AC outlets. This makes it easy to relocate access points in the future if a need arises.

Higher Reliability – Systems with fewer wires tend to be more reliable. With LANs not using PoE, an electrician may unplug an access point to use its AC outlet to power their equipment. Electricians rewiring electrical circuits could inadvertently cut power to an access point. PoE eliminates the possibility of situations that disrupt the operation of the network.

Enhanced Operational Support – Many PoE devices implement SNMP (simple network management protocol), which enables support staff to remotely manage the electrical power supplied to the access points. Support staffs can disable a PoE-enabled access point by shutting off its access point after detecting a malfunction or tampering. The temporary disabling of the access point can protect against in intruder from continuing unauthorized access to the device(s). Other SNMP-based features enable the monitoring of the condition and consumption of power, which enhance the ability to ensure smooth and efficient network operation.

Easier International Development – For manufacturers, PoE offers the benefit of the vendor not needing to provide different power cords for various countries. This not only helps keep the cost of access points down—it is one less piece of equipment that installer need to worry about.

Power-over-Ethernet (PoE) requires:
(Injector) + (PoE compatible device)
Voltage and Pinout Standards – The IEEE has standardized on the use of 48 VDC as the injected PoE voltage. The use of this higher voltage reduces the current flowing through the CAT5 / CAT6 cable and therefore increases the CAT5 / CAT6 cable length limitations.

All Masterclock, Inc. equipment labeled PoE compatible or compliant will accept and operate from the 48 VDC that is supplied over the CAT5 / CAT6 cable.

General

- We accept VISA and MasterCard credit cards.
- We accept Purchase Orders from firms and institutions with acceptable credit.
- All items are generally in stock for immediate shipment.
- Orders can be shipped COD.
- We offer a 30 day satisfaction guarantee on all of our products. If the product does not meet your requirements, return it within 30 days from the invoice date (undamaged – in the original packing - with all accessories intact and freight prepaid) and cancel the Purchase Order or request a refund if the order has been prepaid. Note that software can not be returned without the associated hardware.
- ***All orders are final after 30 days***

Shipping

- Freight charges can be prepaid and invoiced or charged to your freight account.
- All carriers including the Postal Service are available - unless otherwise specified UPS Ground will be used.

Ordering

Credit Card

- Call or Fax to place a credit card order - if ordering by Fax please include the following information: name on credit card, card number and expiration date and list of items to be purchased.

Acceptance of Credit Cards is subject to approval by Masterclock, Inc.

Purchase Orders

- Mail / Fax corporate or institutional Purchase Order signed by an authorized agent to:

Masterclock, Inc.
2484 W Clay Street
St Charles, MO 63301-2548
636-724-3776 (Fax)

Acceptance of Purchase Orders is subject to credit approval by Masterclock, Inc..

For information or help with a order contact:

800-940-2248 (US & CAN)
++636-724-3666
sales@masterclock.com

***** Note ** - Prices are subject to change at any time without notice.***

TERMS OF SALES

- Prices are net US dollars, FOB, our plant.

PAYMENT

- Credit Cards - we accept VISA and Mastercard
- Wire transfer - please request wire transfer information
- Payment in advance by check (in US or other equivalent funds - if by check then shipment will be delayed until check is cleared)
- Purchase Orders - subject to basic commercial terms & conditions, purchase orders (with net 30 days payment) are accepted from:
  - recognized governments and their agencies
  - recognized international institutions and their agencies
  - other international firms and operations with acceptable credit

ALL PURCHASE AND CREDIT CARD ORDERS ARE SUBJECT TO ACCEPTANCE

SHIPPING

- Freight charges can be prepaid and/or charged to credit cards or to invoice
- Charged to your freight account
- Carriers - DHL, Federal Express, UPS, Airborne, Postal Service or other carrier of your choice
- Orders can be shipped to Customs Brokers or Forwarders
- See - ***http://www.masterclock.com/shipping.php*** - for shipping sizes and weights

DUTIES AND TAXES

- Unless credit terms have been established, all duties & taxes must be prepaid prior to shipment or paid upon delivery. If credit terms have been established then duties and taxes can be added to invoice. Duties and taxes can be also be prepaid by wire transfer or billing to credit cards.
- Check with customs, if returning items for repair, to work out shipping issues. Customs may charge duties again unless the proper paperwork is filled out and included when shipping the equipment.

See - ***http://www.masterclock.com/shipping.php*** - for harmonizing tariff codes

Other customers include: Aberdeen, Abu Dhabi International Airport, Australian Broadcasting, BBC, CBS, Chicago Cubs, Court TV, Ericsson, General Electric, Hughes, Hydro Quebec, IBM, Intel, Leitch Video, Lockheed Martin, NASA, Naval Space Technology Labs, NPR, Numerous PSA/Call Centers throughout the globe, Raleigh Durham Airport, Royal Canadian Mounted Police, Sky Channel, Sony Systems, Tele-Metropole, Time Warner Cable, UCLA, University of Missouri, US Air Force, US Army, US Bureau of Reclamation, US Department of Agriculture, VariFone, Walt Disney, Weather Channel, and many, many more…

SUGGESTED FUNCTIONAL SPECIFICATION for a GPS Synchronized Clock System using Network Time Protocol and Power over Ethernet

1.1 SCOPE

This document specifies a wired clock system that relies on the accuracy of the Global Positioning Satellite (GPS) system for synchronizing the time provided to clocks and network devices using the Network Time Protocol (NTP). Such a clock system relies on one or more NTP time servers with an integrated GPS receiver, to act as master clocks and virtually an unlimited number of network clock displays acting as client devices. In addition, other network client devices can benefit from the availability of the NTP timeservers. Data and low voltage DC power can be distributed over the same network cable using Power Over Ethernet technology, resulting in significant cost savings. The limitations are primarily network configuration and implementation based, as the system can be added to an existing network or configured as an independent network to simply provide a synchronized clock display system.

1.2 GENERAL

NTP (Network Time Protocol) servers allow clients to synchronize clocks, bells, computer clocks, other computer timing devices and other kinds of network equipment using a standard reference of time accepted worldwide, known as UTC (Universal Time Coordinated).

NTP servers with an integrated GPS receiver located on a LAN (Local Area Network) can provide the high accuracy of the GPS satellite system to provide the UTC reference time, eliminating the need to receive time from a NTP server located on the Internet. Placing one or more NTP on your local network behind your facilities firewall enhances reliability, redundancy, accuracy, and security.

Using NTP is clearly an advantage since it permits automatic synchronization of all the equipment hooked up to the network, thus reducing the need and associated cost for personnel to travel to remote clock locations to set the time manually.

In general, it has been observed that since the recent introduction of NTP as a standard for network synchronization, clock installations have become easier, better synchronized, more reliable, and provide a traceable source of time for critical network functions, resulting in lower overall cost.

NTP provides a simplified protocol called SNTP (Simplified Network Time Protocol), which clients can utilize to set the time to trusted NTP timeservers. SNTP V4 is a subset of the full NTP V3 version and is widely accepted for client devices.

POE (Power over Ethernet) is a recognized and a growing method of significantly reducing installation costs and providing low voltage DC power to network devices by distributing power over the unused pair of standard network cables. The modest incremental cost of purchasing POE equipment that is compliant to the IEEE 802.3af standard, dramatically offsets the installation costs and safety issues associated with utilizing and distributing AC power.

A GPS Synchronized clock system using NTP and POE offer significant installation and maintenance cost benefits over traditional clock systems.

2.0 REQUIREMENTS

2.1 GENERAL SYSTEM REQUIRMENTS

The synchronized clock system shall meet or exceed the requirements of this specification in all aspects.

2.2 OPERATIONAL REQUIREMENTS AND ENVIRONMENTAL SPECIFICATIONS

Operational Requirements

The clock system shall be located and operated in an indoor environment, within the parameters of a standard network configuration, and utilizing standard industry provided network equipment and distribution methods, including standardized POE distribution technology. The clock system shall operate autonomously and provide software configuration options for time zone offsets, automatic daylight saving time corrections without scheduled operator intervention or maintenance. The clock system shall be configured via software control and shall allow for remote monitoring and configuration changes while providing password protection.

Environmental specifications

The system shall operate under the following environmental conditions:

- Operating Range: 32° F to 122° F (0° C to 50° C)
- Storage Range: -40° F to 70° F (-40° C to 70° C)
- Relative Humidity: 0-90%, non-condensing

Compliance specifications

All equipment shall be tested, labeled and certified by a nationally recognized and approved testing laboratory to meet the following low voltage safety and electromagnetic compliance requirements of the United States and European Union.

- FCC, part 15, Class B limits for radiated and line conducted emissions
- Electromagnetic Compatibility 89/336/EEC ; 92/31/EC ; 93/68/EEC ; 2004/108/EC
- Low voltage directive 2006/95/EC

2.3 CLOCK ENGINEERING REQUIRMENTS AND PERFORMANCE

The network clocks shall meet the following engineering and performance requirements.

2.3.1 Network clock engineering general specification:

The network clocks shall be designed to provide years of reliable and maintenance free service and shall be constructed of all metal enclosures with high impact, UV stable lenses to ensure structural integrity and maximum durability. A wall mounting bracket, or other means, shall be provided for mounting to the surface of a wall.

The finish of the network clocks shall be of a high quality, durable, painted textured powder coat finish and available in a choice of colors.

The network clocks enclosure shall be available in optional unpainted stainless steel material and finish for special applications.

The network clocks shall be available in double faced or dual mount options for applications in hallways or corridors.

The network clocks shall be designed for easy, cost effective, and reliable installation and use standard RJ45, 10MB Ethernet style connectors.

Accuracy:

The networks clock displays shall be accurate to within 50 milliseconds of the UTC time reference provided by the NTP server(s), when synchronized.

Protocol:

The Ethernet wired clocks shall support the following protocols:

SNTP, Simple Network Time Protocol

The network clocks shall operate with an internal reference time that is set to UTC (Universal Coordinated Time) via a built-in the SNTP client, from up to two NTP timeservers. Selection of the primary and secondary servers shall be automatic, but configurable by either static IP address or DHCP provided IP address configuration methods.

The network clocks shall be configurable to operate as an SNTP client in the following operational modes: unicast (or query), broadcast, or multicast.

DHCP, Dynamic Host Configuration Protocol

The network clocks shall utilize DHCP (Dynamic Host Configuration Protocol), by default, as a means of automating the configuration of all required network settings utilizing the optional settings area of a DHCP server. All DHCP network and optional NTP settings shall allow for enabling or disabling at each clock, in order to use static IP address mode network and NTP settings.

Power:

The network clocks shall utilize a standardized Power over Ethernet (POE) technology to power the clock in compliance with the IEEE 802.3af Power over Ethernet specification.

The network clocks shall be considered to be and to operate as Powered Devices (PD); and shall utilize a 48V DC nominal voltage supplied over the spare Ethernet network cable pairs, and/or the shared data/pairs, from an IEEE 802.3af compliant Power Sourcing Equipment (PSE) device, with a 10/100 MB rating, for a distance of up to 100m (328 ft). Power consumption shall be less than 12.95 Watts maximum for all PD equipment. Each network clock PD shall have a typical power rating of less than 7.5 W.

The network clocks shall be made available with an optional AC power. The power input shall be made as a universal type with an input power range of 90-264 VAC, 47-63 Hz and utilizing a standard IEC power jack.

Connectors:

Type Connector

Ethernet 10/100 Base-T: RJ45

The network clock system shall utilize standard Cat 5 or Cat 6 cabling for the distribution of either data, or data and power using the same standard cable, and eliminating the need for an AC power source at the clock location.

Configuration settings:

The time displayed on the face of the network clocks may either be UTC time or local time and shall be configurable via software.

Clock displays shall offer flexibility to allow for any international time zone offset and automatic Daylight Saving Time (DST) adjustment and shall provide maintenance free reliable operation. Configuration changes shall be retained in non-volatile flash.

The network clocks shall utilize an internal maintenance free rechargeable battery backed real-time clock (RTC) to retain the internal time in the event of a power outage or for conditions when the NTP server(s) is not available. The network clocks shall not display the time during a power outage, but shall recover from such power outage as a system without intervention.

During such “free-wheeling” periods and while in operation, the network clocks shall provide a visual indication that the device is relying on the internal oscillator and is not currently synchronized to the network timeserver.

2.3.2 Analog clock engineering specification:

The shape of the analog clock shall be round 12” [30 cm] or 18” [46 cm]. The face of the clock shall be off-white, the time indication marks on face shall be black. The hour markings shall be in an Arabic numeral format and in an easily read font. Minute /second marking shall be provided. The analog clock shall have black hour and minute hands and a red second hand indicator.

The analog clock shall contain a stepper motor drive and state of the art microprocessor and electronics control to rapidly synchronize the hands on the face of the clock to an accurate NTP (Network Time Protocol) reference.

The stepper motor drive and gear system shall be of all metal construction for long maintenance free life and high product reliability. The gear and drive train system shall be smooth and quiet in operation to minimize motor noise.

An LED status indicator on the face of the clock shall illuminate when the clock is not synchronized.

The analog clock shall be available with the following options: LED illumination, double face ceiling or wall mount, stainless steel enclosure.

2.3.3 Digital clock engineering specification:

The displays shall utilize LED’s (Light Emitting Diodes) such that they are easy to read in various lighting conditions, allow for large viewing angles, maximum-viewing distances, long life expectance, and do not require back lighting. The LED’s shall be available in various colors including red, amber, green, and blue displays for various visibility requirements and in various sizes including 2.3” [5.8cm], 4” [10cm], and 8” [20cm] character heights. In addition, the brightness of the LED display shall be fully adjustable via software to allow for the display to be dimmed or brightened remotely, in order to accommodate various lighting conditions and requirements.

3.0 CONFIGURATION SOFTWARE

The network clock system shall be fully configurable and managed remotely through IP via software to simplify the costs associated with administration.

GUI Interface – Windows configuration

The network clock system shall include a GUI (Graphical User Interface) based network software application, operating under the Windows OS, for configuration and maintenance of [the network time server and] all network clocks.

The GUI application shall include password protection of the clock configuration, encrypted communication, and the ability to enable or disable options that might reduce security. A status display to remotely monitor the time displayed on the clock, the internal UTC time, synchronization status, and any error condition regarding the clocks network status shall be provided.

An optional advanced Windows based GUI configuration software package shall be available for separate purchase, for quickly configuring groups of clocks with the ability to save and load configurations.

Console interface – Unix/Linux, non-Windows platform configuration

A separate menu driven telnet console interface shall be provided for configuration, of the network time server and network clocks on a non-Windows OS such as UNIX, Linux.

4.0 REPAIR AND MAINTENANCE

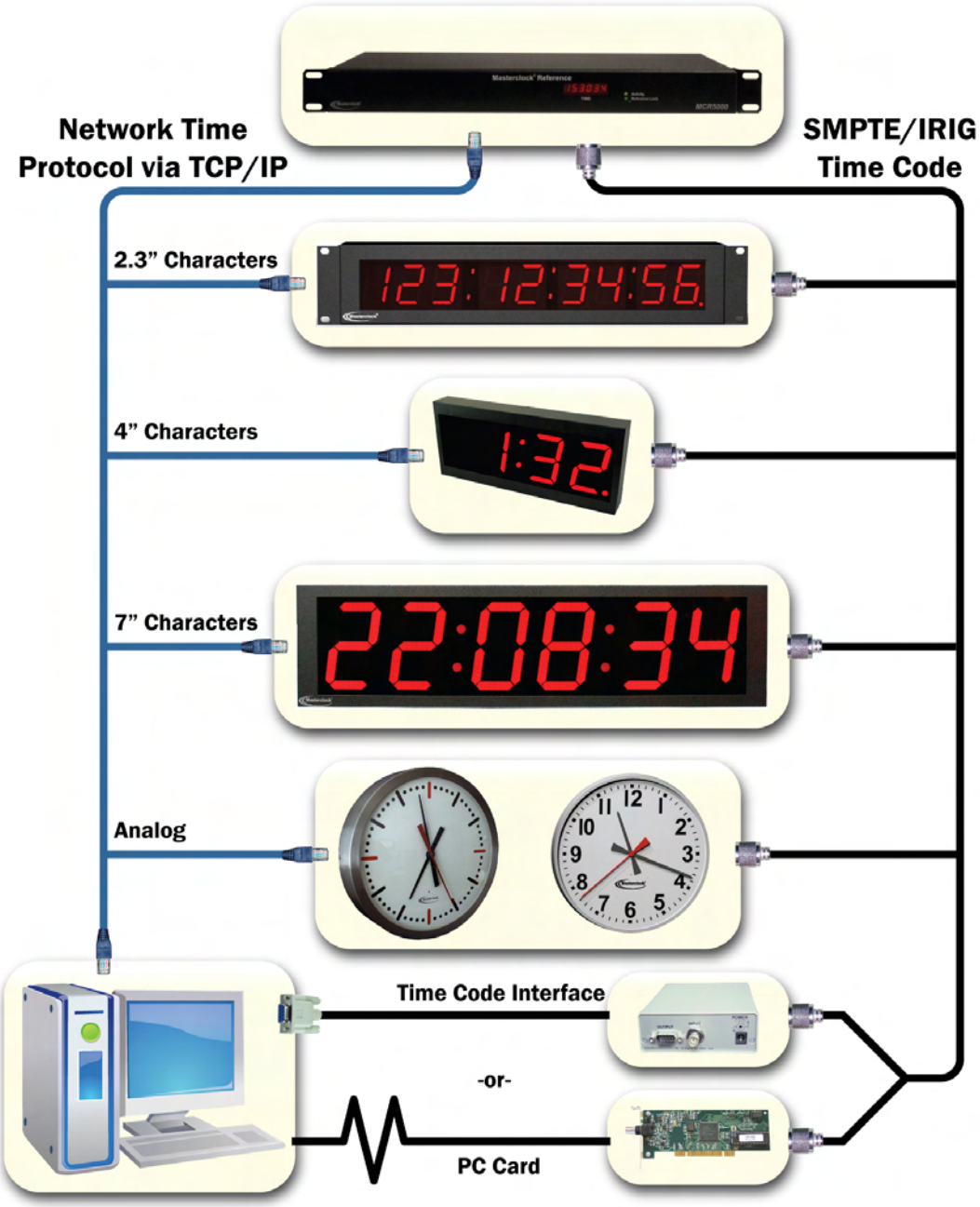
Designed as solid-state devices, the clocks shall require no standard maintenance and shall have no user serviceable or replaceable parts inside in order to reduce the requirement for on-site maintenance and repair personnel.

Any necessary firmware updates shall be made available and able to be applied on location. Instructions and required update files shall be made available for download from the manufacturer's website.

A procedure for trouble-shooting typical installation, configuration, and operational issues shall be supplied as part of the documentation, as part of the user manual.

The manufacturer shall make warranty repair and service, as well as non-warranty repair service, available.

Time synchronization is more crucial than ever before. It has also never been easier to accomplish. Masterclock provides complete solutions using open standards like NTP (Network Time Protocol) and SMPTE/IRIG time code. Just one device can receive atomic clock time and output it to both NTP and time code. The timing signal from there can be sent out to your network over standard cat5 or cat6 cable to sync clocks, computer and other equipment or down daisy-chained coaxial cable to sync clocks computers and other equipment that use time code.



LIMITED HARDWARE WARRANTY

This Masterclock, Inc. (hereinafter Masterclock) product warranty extends to the original purchaser.

Masterclock warrants all electronic hardware products against defects in materials and workmanship for a period of one year from date of sale. If Masterclock receives notice of such defects during the warranty period, Masterclock will, at its option, either repair or replace products, which prove to be defective.

Should Masterclock be unable to repair or replace the product within a reasonable amount of time, the customer's alternate remedy shall be a refund of the purchase price upon return of the product to Masterclock. This warranty gives the customer specific legal rights. Other rights, which vary from state to state or province to province, may be available.

EXCLUSIONS

The above warranty shall not apply to defects resulting from improper or inadequate maintenance by the customer, customer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product or improper site preparation and maintenance (if applicable).

WARRANTY LIMITATIONS

MASTERCLOCK MAKES NO OTHER WARRANTY, EITHER EXPRESSED OR IMPLIED, WITH RESPECT TO THIS PRODUCT. MASTERCLOCK SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

In any state or province which does not allow the foregoing disclaimer, any implied warranty of merchantability or fitness for a particular purpose imposed by law in those states or provinces is limited to the one-year duration of the written warranty.

EXCLUSIVE REMEDIES

THE REMEDIES PROVIDED HEREIN ARE THE CUSTOMER'S SOLE AND EXCLUSIVE REMEDIES. IN NO EVENT SHALL MASTERCLOCK BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER LEGAL THEORY.

In any state or province, which does not allow the foregoing exclusion or limitation of incidental or consequential damages, the customer may have other remedies.

LIMITED SOFTWARE WARRANTY

To the original customer only, Masterclock, Inc.(hereinafter Masterclock) provides the following Limited Warranty.

30 Day Satisfaction Guarantee

For thirty (30) days after date of delivery of the SOFTWARE to you, if you are dissatisfied with the SOFTWARE for any reason you may return the complete product, with your receipt, to Masterclock, postage prepaid, during the thirty (30) day period for a full refund.

Limited Warranty For Next 60 Days

Masterclock warrants that for the sixty (60) days following the initial thirty day period, as evidenced by a copy of your receipt, that:

(1) The SOFTWARE will perform substantially the functions described in the documentation provided by Masterclock.

(2) The media on which the SOFTWARE is furnished will be free from defects in materials and workmanship under normal use.

Your sole remedy under the warranty during this sixty (60) day period is that Masterclock will undertake to correct within a reasonable period of time any reported "SOFTWARE Error" (failure of the SOFTWARE to perform substantially the functions described in the documentation), correct errors in the documentation, and *replace any magnetic media which proves defective in materials or workmanship on an exchange basis without charge. In order to make a claim under this warranty you must return the defective item with your receipt to Masterclock, postage prepaid, within ten (10) days after the warranty period. If Masterclock is unable to replace defective media or if Masterclock is unable to provide corrected SOFTWARE or corrected documentation within a reasonable time, Masterclock will, at its sole and exclusive option, either replace the SOFTWARE with a functionally equivalent program at no charge to you or refund the license fee of the SOFTWARE. These are your sole and exclusive remedies for any breach of warranty during this sixty (60) day period.

Masterclock does not warrant that the SOFTWARE will meet your requirements, that operation of the SOFTWARE will be uninterrupted or error-free, or that all SOFTWARE errors will be corrected. Masterclock is not responsible for problems caused by changes in the operating characteristics of computer hardware or computer operating systems which are made after the release of the SOFTWARE nor for problems in the interaction of the SOFTWARE with non-Masterclock software. Masterclock will have no responsibility to replace or refund the license fee of media damaged by accident, abuse or misapplication.

THE ABOVE WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER EXPRESSED OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NON INFRINGEMENT. NO ORAL OR WRITTEN INFORMATION OR ADVICE GIVEN BY MASTERCLOCK, ITS EMPLOYEES, DISTRIBUTORS, DEALERS OR AGENTS SHALL INCREASE THE SCOPE OF THE ABOVE WARRANTIES OR CREATE ANY NEW WARRANTIES.

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SOME STATES DO NOT ALLOW THE EXCLUSION OF IMPLIED WARRANTIES, SO THE ABOVE EXCLUSION MAY NOT APPLY TO YOU. IN THAT EVENT, ANY IMPLIED WARRANTIES ARE LIMITED IN DURATION TO NINETY (90) DAYS FROM THE DATE OF DELIVERY OF THE SOFTWARE. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS. YOU MAY HAVE OTHER RIGHTS, WHICH VARY FROM STATE TO STATE.

LIMITATION OF REMEDIES

REGARDLESS OF WHETHER ANY REMEDY SET FORTH HEREIN FAILS OF ITS ESSENTIAL PURPOSE, IN NO EVENT WILL MASTERCLOCK BE LIABLE TO YOU FOR ANY SPECIAL, CONSEQUENTIAL, INDIRECT OR SIMILAR DAMAGES, INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS OF BUSINESS PROFITS, BUSINESS INTERRUPTION, LOSS OF DATA OR BUSINESS INFORMATION (OR OTHER PECUNIARY LOSS) ARISING OUT OF THE USE OF OR INABILITY TO USE THE SOFTWARE OR ANY DATA SUPPLIED THEREWITH EVEN IF MASTERCLOCK OR ANYONE ELSE HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, OR FOR ANY CLAIM BY ANY OTHER PARTY.

SOME STATES DO NOT ALLOW THE LIMITATION OR EXCLUSION OF LIABILITY FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.

IN NO CASE SHALL MASTERCLOCK'S LIABILITY EXCEED THE PURCHASE PRICE FOR THE SOFTWARE.

RMA Instructions

Step 1: Read this RMA policy statement
Step 2: Complete the RMA form and sign
Step 3: Fax RMA form to (636) 724-3776 or email support@masterclock.com
Step 4: Receive faxed or emailed RMA number from Technical Support
Step 5: Print the RMA number on the outside of the shipping box
Step 6: Ship product(s) to:

Attn: RMA#_____
Masterclock, Inc.
2484 West Clay Street
Saint Charles, MO 63301

RMA numbers are valid for 30 days. Incomplete forms will result in a delay or refused RMA.

TERMS

Satisfaction Guarantee Return

Masterclock, Inc. offers a 30 day satisfaction guarantee on all of our products. If the product does not meet your requirements, return it within 30 days from the invoice date and cancel the PO (Purchase Order) or request a refund if the order has been prepaid. This return privilege is subject to the following conditions. Any returned merchandise must be packed in the original shipping container and packing material complete with all instruction booklets and accessories. It must be free of any blemishes and show no signs of damage. Software cannot be returned without the associated hardware. Before any item can be returned to Masterclock, a RMA form is required, which must be obtained within 30 days of the date of the original Masterclock invoice.

You, the purchaser, are responsible for all freight, insurance and taxes (if any) for both shipping and returning any product and agree to pay any such charges that may have been included on the original Masterclock invoice. Because the cost associated with evaluation processing and returns can be substantial (for both parties) we ask that you limit items ordered for evaluation to the minimum unit quantity needed.

After 30 days – all sales are final.

Exchange: Refers to returning items to receive different product

Items that are returned for credit or exchange due to a mistake on customer's part (ordered wrong, end user changed their mind, improper installation, etc.) will be exchanged only after receipt of authorization for payment for 15% of item value with a minimum charge of $50. ***After 30 days – all sales are final*.**

Upgrade: Refers to returning items to have an option(s) installed

Items that are returned to have an option installed will require a 24 hour burn-in. During this period, functionality of the product will be checked and firmware updates will be performed unless stated on the RMA form, not to have this done.

Warranty Repair: Items returned for repair or replacement within applicable warranty period

1. If a warranty item is found to be defective it will be repaired or replaced by Masterclock in accordance with our warranty policy and returned via prepaid ground freight.
2. If a returned item is found not to be defective then return freight & insurance will be charged to the customer in addition to evaluation fee described below.
3. Incoming freight (and insurance) for all returned items must be prepaid by customer.
4. A $100 evaluation fee will be charged for items that are returned as defective but test functionally good or for items that have been modified or damaged by customer, such items will be returned unprocessed to the customer.

Non-warranty Repair: Items returned for repair after expiration of warranty period

1. You will be advised of the cost of any repairs and we will require a credit card number or purchase order prior to any work being started. A $100 evaluation fee will be charged for any un-repaired item returned at the customer's request.
2. A $100 evaluation fee will be charged for any item that is returned for non-warranty repair as defective but test functionally good.
3. Merchandise received, which has been modified by customers will be returned unprocessed to the customer and a $100 evaluation fee will be charged.
4. Incoming and return freight and insurance for items will be charged to the customer.

Filling out RMA Request Form

1. RMA numbers will be issued only with the proper Masterclock's invoice number.
2. You must provide a reason for the product return. If defective, please provide a detailed description of the problem.
3. Mark the action you desire to be taken in regards to your RMA - Credit, Exchange, Upgrade, Warranty Repair or Non-warranty Repair. If you are requesting an exchange, please indicate which items/quantity you wish to exchange for.

Shipping Items

1. RMA numbers are good for 30 calendar days only - no exceptions. RMA's returned after this time will be automatically refused.
2. Merchandise returned without an RMA number clearly marked on top of the box or returned without prior authorization, will be automatically refused.
3. Merchandise returned COD (Collect on Delivery) will be automatically refused.
4. Masterclock has a ship after receive policy. We must receive the products before we can ship your replacements. If any item is critical to your operation we suggest that a backup item/system be purchased – talk to our sales department.

Suggestions

1. Please have RMA number and RMA Request Form available when calling Masterclock regarding an RMA process.
2. If Technical Support is not available and you are transferred to voice mail please leave your name, company name, RMA number and reason why you are calling on the message. You can also email Technical Support at support@masterclock.com
3. Please do not ship items back for repair with accessories, unless accessories are suspected to be the cause of the problem or unless instructed to do so by Technical Support.
   If customer returns items not specified on RMA Request Form, customer hereby releases Masterclock from any responsibility regarding loss or damage of those items.

WARRANTY

See our complete warranty statement in your product manual, on the web at:
http://www.masterclock.com/warranty.php or request a copy by mail or fax.

RMA#

Masterclock's RMA Request Form

PLEASE SEE ATTACHED RMA TERMS & CONDITIONS FOR ADDITIONAL DETAILS

Date: _____ Company Name: _____

Address 1: _____ Address 2: _____

City: _____ State/Country: _____ Zip/Code: _____

Contact Person: _____ Phone: _____ Fax: _____

Quantity	Model #	Serial #	Invoice Date	Invoice #

Type of return:

Credit Exchange Upgrade Warranty Repair Non-warranty Repair

Detailed reason for this return:

_____

_____

_____

We will make every reasonable attempt to resolve the problem to your satisfaction and, if necessary, will contact you after you submit this request by email or fax. If we do issue an RMA, please do not delay in returning the item, as this RMA will expire in 30 days. **All sales are final after 30 days.**

Each unit returned and found to meet all functional requirements, you agree to pay the $100 evaluation fee and the return shipping charges as outlined in the terms and conditions.

By typing your name below you agree to Masterclock's RMA terms and conditions.

I have received, read, understand and agree to the Masterclock RMA terms & conditions.

_____ _____

Signature for authorizing repair Date

For Internal Use Only				
Return Received By:	_____	Received On:	_____	Note: _____
Replacement Sent:	Y / N	Sent On:	_____	_____
Restocking Fee:	_____	Credit Amount:	_____	_____

CUSTOMER REQUEST FOR CREDIT

This is a request for net 30 days credit from date of shipment. We understand and agree that if payment is not received by Masterclock within 30 days of shipment date then a 1.5% charge will be added for each month or part thereof that the payment is late.

Please print or type and complete all sections fully.

Business Name_____ Telephone_____

Address_____

City_____ State/Prov_____ Country_____

Web Site(URL)_____

Business Type: ☐ Sole Proprietorship ☐ Partnership ☐ Corporation

Incorporated in the state/country of_____

How many years in business under the name listed above?_____ Annual revenue last year:_____

What is your rating (if known) by Dun & Bradstreet:_____

Federal ID#:_____ If tax exempt, please attach completed resale certificate.

Amount of credit requested (in U.S. Dollars):_____

CONTACTS

ACCOUNTS PAYABLE:

_____ _____ _____
Name/Title Phone Email

Corporate Officer / Senior Manager:

_____ _____ _____
Name/Title Phone Email

BANK / TRADE REFERENCE INFORMATION

Bank:_____ Tel#_____

Full Address:_____

Account#_____ Bank Contact Name _____

TRADE CREDIT REFERENCES (PLEASE SUPPLY FULL NAME & COMPLETE ADDRESS)

	Company Name	Contact	Address	Phone
1)				
2)				
3)				

We hereby authorize the above listed credit references to release information to Masterclock, Inc. for use in the evaluation of this request. On behalf of the applicant, the undersigned hereby warrants that the above information be true, correct and complete. All sales are subject to the Masterclock terms & conditions on file at Masterclock offices and available to all applicants. Note that Masterclock will automatically add sales tax to shipments sent to Missouri addresses or companies incorporated in Missouri.

I hereby certify that I am authorized to sigh and submit this application for and on behalf of the company named above.

Signature_____

Name_____ -Title _____ Date _____
(please print)

For *Masterclock,* Inc. *Corporate office use* only

Date Received_____
References Checked/Credit Report Run By:_____ Credit Approved/ Denied by:_____ Credit Limit:_____
Notes _____

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